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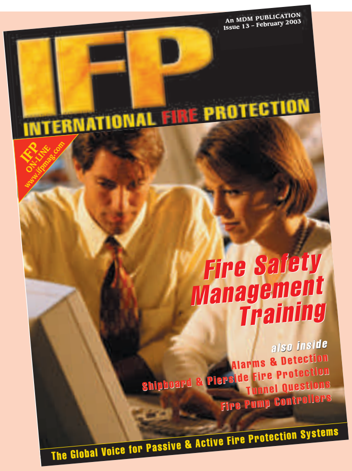

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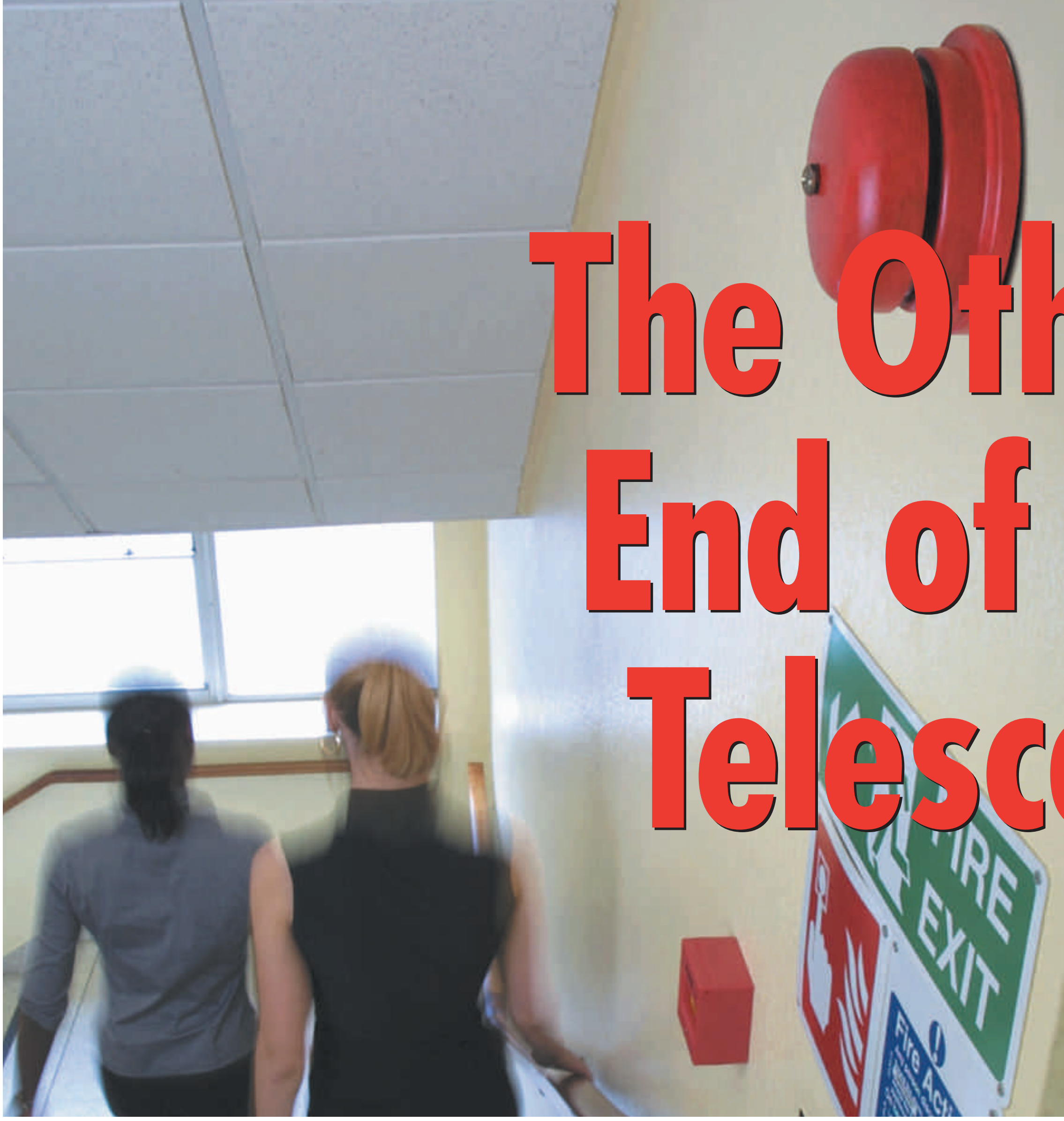


The Other End of the Telescope

ROB YATES, Product Marketing Manager (Fire) – Fire & Security Products at Siemens Building Technologies Ltd, suggests that the fire protection industry can learn much by taking on the end user's perspective when considering fire alarm and detection equipment.

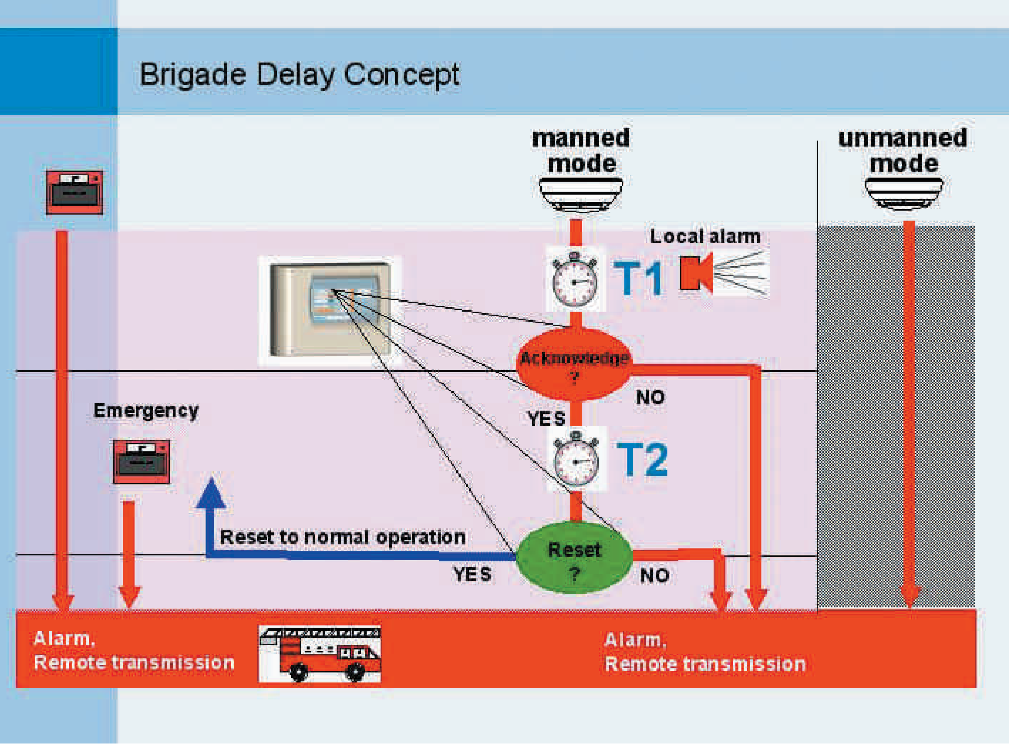
It is a useful exercise for professionals within the fire alarm industry to consider fire alarm systems from an end user's perspective. In general an end user is concerned with opening his new property or continuing his day-to-day business. He is aware that often there is legislation requiring a fire alarm system to protect occupants and that failure to comply could result in the property closing while the problem is addressed, but knowledge beyond these basic assumptions is often sadly lacking. This is currently an area of concern for those involved in fire protection. Levels of awareness of the Fire Precautions Workplace Regulations are poor, with many building owners/occupiers unsure of their actual responsibilities in terms of fire safety. The new Fire Safety Order, scheduled to be introduced in Spring 2004, offers a real opportunity to address this issue to ensure that the end user's knowledge of fire safety legislation and his responsibilities under fire risk assessment are greatly improved.

In the meantime, a consequence of this lack of understanding and the low priority often given to fire protection means that many fire alarm systems are therefore designed to provide the minimum protection sufficient to meet life safety legislation. To the customer this makes the system an essential burden rather than a useful facility. Every subsequent problem, be it a fault, an addition or a false alarm is seen as increasing that burden. The fire panel sits by the reception unloved and unwanted – a problem waiting to happen which will then further drain the customer's limited funds.

The more people are evacuated for spurious reasons, the less responsive they become, it is in everybody's interest to reduce these incidences of false alarms

The problem with the customer is he does not usually understand the many ways in which fires can start, nor how rapidly they can develop. In fact many customers will have memories of how difficult fires are to start when lighting a fire at home or while camping. All customers will express their understanding of how dangerous fires can be but few deep down really understand why. Just how dangerous is not only an issue of life safety. The following facts help to put into context the potential financial consequences for a company:

- Fire is estimated to cost the UK economy some £7billion annually.
- An estimated 3 out of every 4 businesses that experience a serious fire go out of business either directly as a result of the fire or within 3 years of reopening.



The 'manned' option on a 'manned/unmanned' system allows signals to the brigade to be delayed

Where the property is new, an architect or consultant often specifies the fire alarm system. The main or electrical subcontractor will then choose the system installer. The end user very often has no or at least limited involvement and, it therefore follows, very little interest. However it is the end user that will have to live with the system, experience every fault and false alarm and cover the ensuing costs.

Best practice therefore is to include the end user in the design and decision making process from the start. This is, though, usually impractical due to time constraints, other priorities and, of course, lack of customer interest. This does not excuse the system designer from at least attempting to consider the needs of his ultimate client; neither does it excuse them from attempting to show their client the benefits of a system that does a little more than the minimum required for legislative purposes.

DETECTION

One problem that the end user is always conscious of is false alarms. He is capable of determining the rate, inconvenience and cost of false alarms caused by his system far more readily than the system's relative sensitivity or usefulness. The system's negative aspects are therefore much more prevalent in the customer's mind than the positive aspects.

In the early days of automatic detection many problems were experienced due to the products themselves. In particular problems relating to electro magnetic compatibility (EMC), mechanical design and crude optics led to a false alarm rate over and above those experienced purely through deceptive phenomena. Refinements made over the years have reduced false alarms significantly, a fact highlighted by the BFPSA (British Fire Protection Systems Association) and CACFOA (Chief & Assistant Chief Fire Officers Association) initiative on false alarms. In addition new technologies, higher processing power and sophisticated algorithms enable detection systems to filter out some of the problems created by deceptive phenomena while at the same time increasing sensitivity to a broader range of fire types.

Despite these advances, steam dust and aerosols can still trigger a basic point type detector. Even without these problems, burning toast, fuels, cooking by-products and other causes of smoke remain. Too often this causes the system designer to reduce the level of protection offered by the system. Smoke detectors are replaced by rate of rise heat detectors where production processes may affect them, rate of rise detectors are themselves often replaced by fixed temperature versions for similar reasons. Even worse, areas of detection can be removed completely, if not at the design stage then later by maintenance personnel or end users as an ultimate "fix" to the inconvenience of false alarms.

FALSE ALARM FILTERING

The problem with any reduction in detection is that the system becomes incapable of detecting fires when it is most needed or is at least considerably slower. With a little more thought during the design/specification stage this reduction in detection may be unnecessary. The simple fact remains that the overwhelming majority of false alarms are created while the premises are occupied while 67% of all fires occur after 6.00 pm when the building is unoccupied.

During occupied periods people who are very effective fire detectors can offset a reduced level of detection. However, when this reduction in detection is continued during unoccupied periods the performance of the system is severely compromised.

False alarm filtering is a useful method of maintaining sensitive detection during unoccupied periods while

Fire is estimated to cost the UK economy some £7 billion per year

The FC 500C alarm panel from Siemens FSP is able to differentiate between detectors and call points on the same circuit

reducing false alarms during troublesome occupied periods. Basically the system works in two distinct modes: 'manned' and 'unmanned'.

In manned mode devices can be programmed either not to activate the sounder or to activate the sounder but not send an immediate signal to the fire brigade. Alternatively with modern analogue addressable systems it may be possible to reduce the sensitivity of some detectors by day and return to full sensitivity at night. Manual call points can be treated quite differently and conventional panels such as Siemens FC500C are now available with the facility to differentiate between detectors and call points on the same circuit. The important thing is that the system is returned to full sensitivity at night when the premises are unmanned. This should be done automatically.

COMMUNICATIONS

Of course false alarm filtering as discussed above assumes that the system has been connected in some way to the fire brigade. However many systems have no such connection. This means that the return on the end user's investment in a fire alarm system during unoccupied periods is nil. The positive arguments for the fire alarm system are reduced further.

Communication via an ARC (Alarm Receiving Centre) brings further benefits. Faults are monitored and engineers can be summoned automatically. Periods of isolation can be monitored and recorded, as can the user's weekly tests. The weekly test by the user is probably the most important aspect of the servicing of a fire alarm. Huge confidence can be gained in the system integrity if the weekly tests are done properly. In addition they are excellent at getting the end user to take some responsibility for the system. Instilling in the end user the habit of doing these tests can be another matter. However if these tests are recorded by the ARC then not only can proof be provided that these tests were undertaken but the ARC can remind end users of any lapses in their routine.

ALARMS

People involved in the fire industry tend to respond to alarms rather more seriously than the wider public. When a hotel fire alarm system is activated at 3am most people in the trade will dutifully evacuate immediately. Those not from the industry will tend to see if the alarm is silenced in the early stages before dressing and staggering into the cold night air. The more people are evacuated for spurious reasons the less responsive they become. It is therefore everyone's responsibility in the trade to take the utmost care in providing alarms and detection systems that suit the situation.

Let's take the hotel example a little further. At 3am in the morning what are the likely causes of fires or false alarms. Fires can start from electrical faults, smokers, cooking, arson etc.

Occupants smoking in their rooms or the bar are a common cause of false alarms as are residents taking showers and activating the smoke detector within their rooms. Note here that the system designer has to consider the conflicting needs of the smoker: that is his tendency to cause false alarms weighed against his high fire risk.

Too often system designers respond to this challenge by reducing the level of detection. They may replace smoke detection with rate of rise heat detectors within the rooms. This form of detection is usually adequate to protect the other occupants in the hotel. However, they are not suitable for protecting the occupant of the room where the fire originates as smoke may overcome him before the detector is activated.

Providing the hotel is well staffed, bedrooms have adequate fire separation and that all other considerations required by risk analysis allow, then a two-stage alarm system can provide a high level of detection with a low level of false alarms and unnecessary evacuations.

It is possible for instance that a smoke detector within a bedroom can activate a sounder within that room only. At the same time staff can be alerted, but a full-scale evacuation of occupants delayed for a short period while the cause is investigated. If corrective action is not forthcoming or other detectors or manual call points are triggered then a full evacuation is commenced immediately. No such filtering need be instigated for detectors protecting kitchens, corridors, ceiling voids etc, – these will be programmed to immediately generate a general evacuation.

A great deal of time and energy goes into writing specifications for medium/large applications. Comparatively, very little thought goes into specifications for small/medium applications yet most of the facilities mentioned above are available in products aimed at this market. Too often smaller systems have no connection to the Fire Brigade, only operate on a one out all out evacuation and are never tested by the user. The only time the user notices that they have a fire alarm installed is when they are evacuated into the car park for no good reason. With a little more attention from specifiers and installers an end user can be left with a far more positive view and a greater feeling of involvement in their system.

Rob Yates
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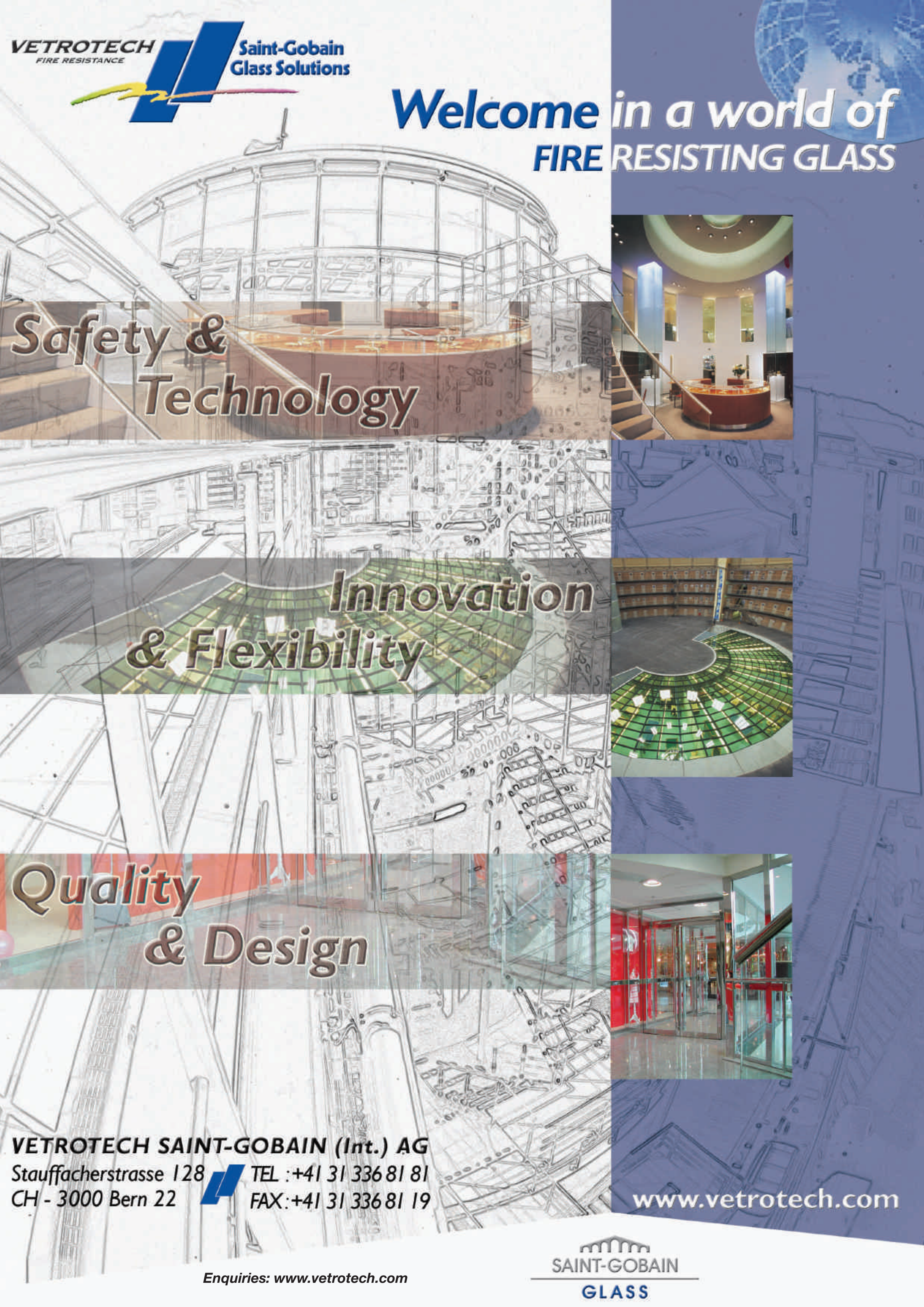

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Is industry ready for CE Marking?

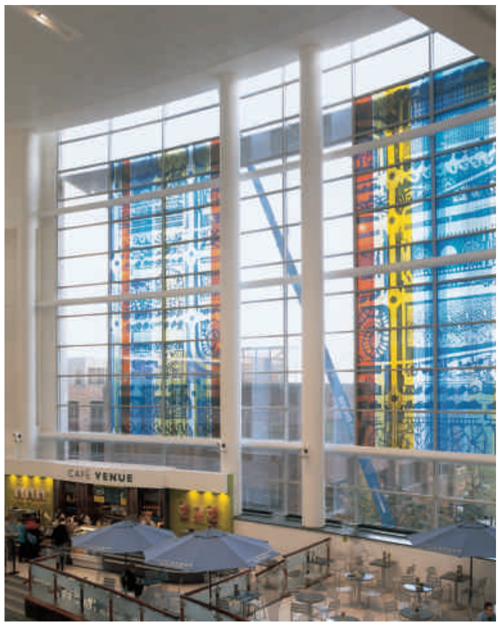
Pilkington Pyrostop – Edinburgh, One Morrison Street

Mike Wood of Pilkington takes his regular personal view on the main issues concerning fire-resistant glazing in anticipation of the implementation of CE Marking. The implications for industry are deeper than just a product classification report and a product certificate. The need to demonstrate fitness for purpose and safety in case of fire, underlying principles of CE Marking, and the CE Marking process itself, can be seen to be of fundamental importance in the development of best practice in fire-resistant glazing. There is also an issue raised by the exclusion of installation from CE Marking that needs to be noted by industry, the market, and authorities alike.

It isn't possible to attend an industry meeting these days touching on fire-resistant glazing without the topic of CE Marking coming up, either on the agenda or in the course of discussion. It's usually met by the same response each time – suppressed groans, mostly because of the confusion and uncertainty surrounding the somewhat technical CE marking process against the realisation that it isn't that far away and therefore that something will have to be done, probably quite soon. But, what? And, when? Both questions are not that straightforward to answer, as relevant product standards are variously somewhere between availability and work still in progress. The process of achieving the CE mark is also unclear in some respects, and probably won't get any clearer until practical experience starts to build up.

What can cause some concern is the apparent low level of awareness in the industry at large. It is becoming increasingly apparent, as we get closer to the market – that is, the final assembly leading to installation – that the awareness of what is required on completion of the job falls off quite markedly. It seems that the motivation to find out isn't there, and that CE Marking is not particularly viewed as being relevant to day-to-day business. In general, it's an unwilling and uninterested audience out there. CE Marking doesn't seem to be a burning issue in the fragmented and dispersed local levels of glazing and associated trades.

CE Marking is about the removal of technical barriers to trade across the European Community and the freedom to place products on the market. This is increasingly becoming a paradox when the level of interest at the local market level (where the products are finally and literally placed) seems to be so apparently low. There is certainly a communication challenge here to industry, standards and regulatory authorities alike. There is also a crucial flaw in the scope of CE Marking, in that it specifically does not include the installation process and excludes construction elements assembled from components on site (in "the construction works"). So, given that the glazing industry works across many European countries on a sub-contracting basis, with one company installing the frame and another coming along later to separately install the



Pilkington Pyrostop – Midsummer Boulevard, Milton Keynes

Pilkington Pyrostop – IMAX cinema

glass, glazing seals and fixings then it's quite understandable that a proportion of the industry may well think that CE Marking really does not affect them. The European authorities need to look at this potentially fatal loophole, especially if they want the CE Marking process to be both live and successful.

On the other hand, this omission raises issues around independent third party certification schemes to cover installation. The UK's Passive Fire Protection Federation will shortly be publishing a report on best practice for passive fire protection, including a recommendation that all passive fire protection measures should be installed by accredited third party installers. The need for such schemes has been recognised for some time in the UK. A model exists. The Glass and Glazing Federation has developed such an installer certification scheme for fire-resistant glazing, which has now been running for some years. Subsequent events may prove this scheme to be ahead of its time. There will be an enhanced need for such installer schemes, I would suggest, especially in the wake of the introduction of a CE Marking system that specifically excludes installation. For manufacturers and users alike, it makes no sense to compromise the product's fitness for purpose through CE Marking if it is not to be installed correctly at the end of the supply chain. Installation of fire-resistant glass is a specialist job. It isn't the same as the glazing of standard window glass or non-fire rated vision panels and partitions. Fire-resistant glass is a high performance product that can be installed in a range of diverse framing arrangements. The range of such glazings is wide, and there can be important differences between the different types, which can significantly affect performance. The glass and sealant combination can also be important, especially with products such as special toughened fire-resistant glass. It isn't necessarily acceptable to exchange one sealant for another. The affect on fire resistance performance could be catastrophic. The glazier therefore needs to know his glass and the glazing conditions under which fire performance is achieved. Some fire-resistant glass products are more sensitive to glazing conditions than others and will not perform their fire resistant function if glazed incorrectly.

The omission of installation from CE Marking raises another potential difficulty. Finished glazed assemblies delivered to site carrying the CE Mark may be compared with exactly the same assembly constructed piece by piece on site, which does not require a CE Mark certification because such on-site assembled elements fall outside the defined scope of the Construction Products Directive. This is an inconsistency, which is somewhat difficult to come to terms with. And in practice a concern that can detract from the credibility of the CE Mark. Don't forget that for industry the cost barrier of certification and demonstrating conformity to the new European standards will be very high in terms of time, effort and testing. If the imposition isn't the same for all, and the value of the investment in CE Marking is seen to be limited, then the motivation towards making the system work may, not surprisingly, be reduced.

Underlying the CE Marking process is a central safety issue: the Construction Products Directive draws specific reference to safety in case of fire; and the European technical standards are written in terms of properties, tests, and performance parameters designed to demonstrate fitness for purpose for health and safety. Although the original CPD objective does not cite the development of safer buildings, this surely is a logical

Pilkington Pyrodur™ – The Corn Exchange, London

interpretation of the end point of the process that has been set in train. Certainly I think that this will be the way that the specifier, client and user part of the wider market will most probably see it. The needs to safeguard people and property against the affects of fire are widely recognised. New EN test standards and classifications will automatically come to be seen as the latest best practice, and failure to measure up to them will be seen as a negative against the product in question. Compliance with the Health and Safety Directive means that fire safety is a very important issue for owners of buildings. Fire-resistant glass structures are now an important part of modern buildings to create bright and open designs. It is therefore vitally important that fire-resistant glazed assemblies perform to the level of fire performance that is required, with consistency and reliability. It isn't advisable to play fast and loose with fire safety.

It is therefore even more important to understand and live by the Golden Rule of fire-resistant glazing. This is that fire-resistant glass can only function as part of a reliable fire-resistant system – that is the glass, the glazing seals, the beads, bead fixings, frame, framing junctions, frame fixings *and installation*. It is the system that has to function as an integrated whole. Changing one part of the system in isolation without reference to the impact on the performance of the whole system could be catastrophic in terms of performance under real fire conditions. If we look at fire-resistant glass, there are important differences between the different types, even though they may have at face value the same generic performance classification. The limits of performance, levels of reliability and consistency may not necessarily be the same. What is achieved with one fire-resistant glass may not be achievable with another: tested approvals apply only to the particular configuration as tested, the particular glazing sizes, aspect ratios and framing details. How one type of fire-resistant glass reacts in a fire may well be entirely different from another. The technical specifications and performance capabilities can be significantly different in important respects under certain conditions. The performance of a fire-resistant glass cannot be calculated. Against such a background, making extrapolated assessments of performance becomes more and more questionable as the assessment moves further away from a base in tested data or commonly accepted rules.

There is an important message to the members of the fire-resistant glazing industry. Suppliers and fabricators of fire-resistant glazed screens are in danger of being frozen out of the process while technical committees argue over the close details on the way towards European harmonisation and CE Marking. Yet the implications for those companies in the industry could be tremendously important. There will be fundamental change in the way that the market has to be approached. Is the wider fire-resistant glazing industry sufficiently tuned in to the change? I suspect not. Should this be of concern to the industry leaders, authorities and associations who have to give a lead and represent industry members? In my view, yes. I think it's certainly time for the glazing industry to take note of CE Marking.

Introducing the
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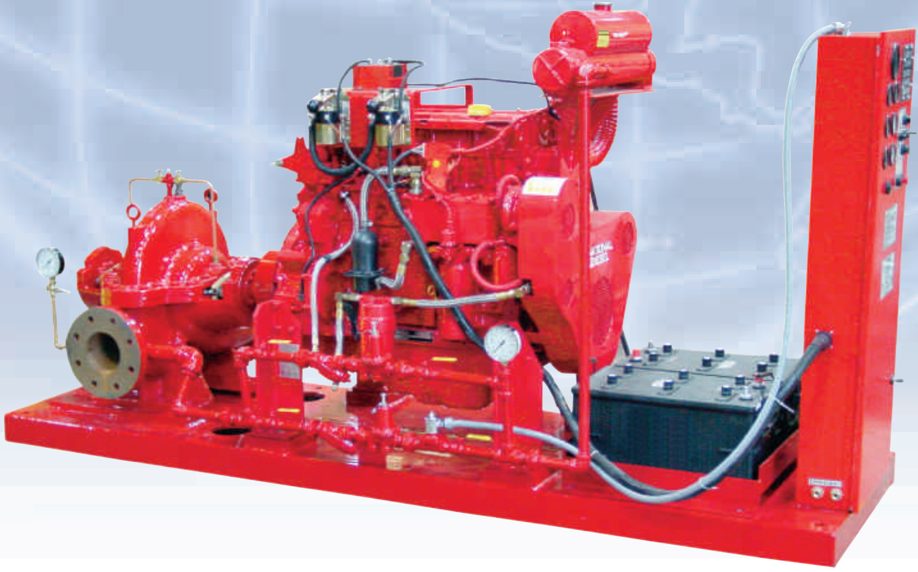

Look No Further!

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Fire Pump Controllers

By David Carter
General Manager of Metron Eledyne

Pic courtesy of Metron Eledyne

A LARGE BUILDING or factory requires some kind of fire protection. In most cases, the public water supply cannot provide enough volume and/or pressure so a fire pump installation is required. A typical fire pump installation includes several components:

- A fire pump that is designed to handle the type of water supply available
- A pump driver, either an electric motor or a diesel engine
- A fire pump controller for automatic operation of the pump driver
- A gear drive for transmitting power from the pump driver to the pump itself
- A water relief valve to relieve or limit excess pressure in the event of diesel overspeed
- A water supply, either from a natural or man-made pond or from a water tank.

There are many different fire pump controller rules and regulations throughout the world. The nearest thing we have to a world standard is the NFPA 20 (National Fire Protection Association pamphlet 20). NFPA 20 originates from the USA.

All buildings, factories and industrial sites are insured, a large number of which are under written by an American based company called FM Global. FM is a major force in the world of fire pump controllers since they approve them for use within their insured buildings. FM uses the NFPA20 specification as their guidelines when approving controllers.

Diesel Engine Driven Fire Pumps

The standard NFPA20 specifies in detail the correct operation of the fire pump system and in particular the controller functions. On a diesel set, there are two engine starter batteries fitted, either a 12v or 24v. It is the controller's responsibility to ensure that these batteries are fully charged and ready to crank the engine in an emergency. NFPA20 specifies that the battery charger must be able to completely re-charge these batteries from a fully discharged state within 24 hours. The controller must have facilities to manually crank the engine and to have an automatic start function via a crank timer. The standard defines the crank timer operation as:

- **15 seconds crank from battery A**
- **15 seconds dwell**
- **15 seconds crank from Battery B**
- **15 seconds dwell**

This sequence is repeated three times after which a failed to start condition is realised. At all times, the battery voltage is monitored. Should the voltage fall below ½ the normal float level, then that battery becomes locked out from further cranking.

Once the engine is running, it is monitored for:

- **Low oil pressure**
- **High water temperature**
- **Engine Overspeed**

Only the engine overspeed alarm is allowed to shut the engine down. The rules specify that low oil pressure and high water temperature must not shut the engine down in a fire condition. The

Metron Eledyne Introduces its new FM approved controller…

Like Metron, its Denver based sister company, Metron Eledyne occupies a modern engineering and manufacturing facility from which it serves the worldwide market, covering commercial, residential and industrial premises and also specialising in the Oil, Gas and Petrochemical field.

TWP Corporation, the parent organisation, has grown into a multi-million dollar international group of companies since its inception in the late 1950s, offering a broad range of products and services. Metron Eledyne routinely pools technology and manufacturing resources with other TWP operations, including Tecknit EMI Shielding Products and Tecknit Shielding Systems.

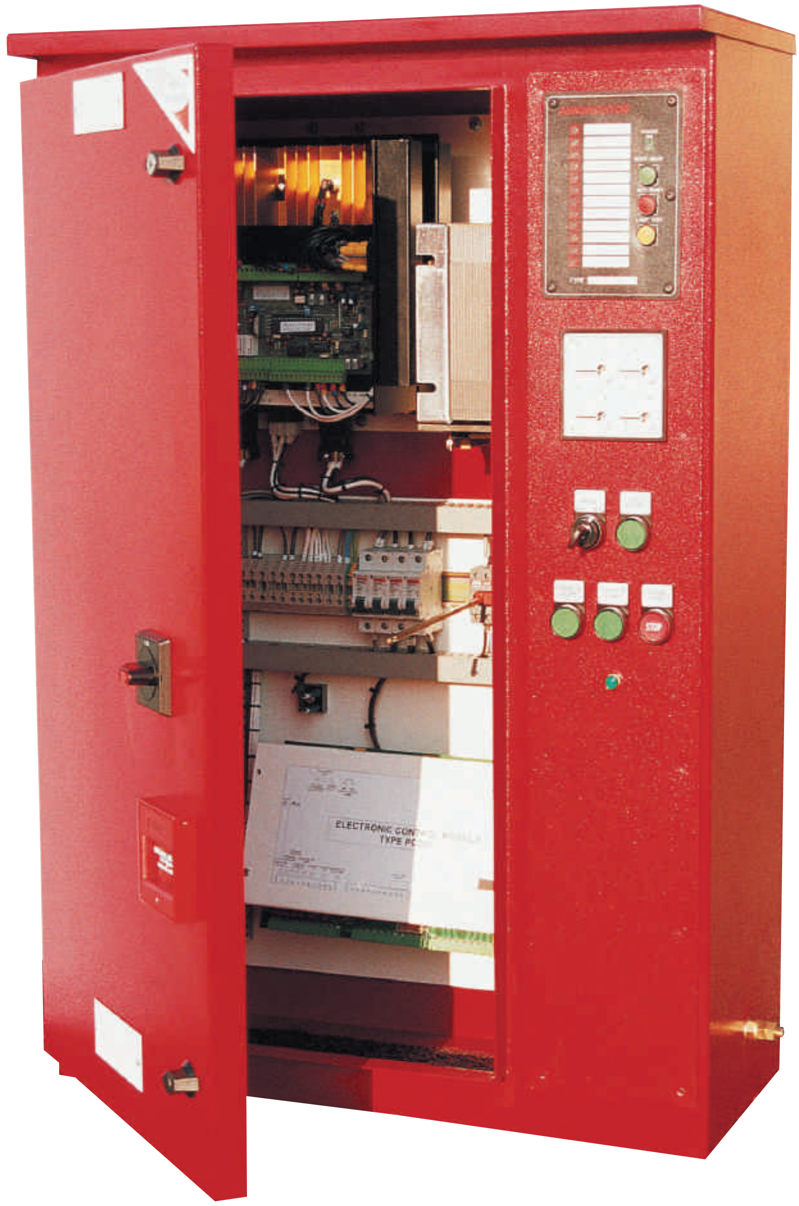
The highly experienced engineering team at Metron Eledyne's 20,000 square foot facility in Grantham, England, are experts in power engineering, controller design, and custom package design as well as microprocessor and electrical control-logic product development.

The FD3e, the company's latest unit, is specifically designed to meet the latest standards for NFPA20 diesel engine fire pump controllers implementing the latest components and logic technology.

Inside the controller, mounted on the cabinet, is a fully automatic 10 Amp battery charger which ensures that the engine batteries are fully charged within 24 hours. Also located within the charger is a battery and battery charger-monitoring unit.

The FD3e can be wall mounted or fixed to the engine skid using anti-vibration mounts. An optional freestanding plinth is also available. A pressure switch, drain valve and pressure recorder, mounted on the outside of the controller, ensure electrical equipment is not exposed to water.

The controller comes complete with a RS232 monitoring port enabling clients to monitor all functions remotely on a PC via free software that can be downloaded at http://www.firepumpcontrols.co.uk



Pic courtesy of Metron Eledyne

engine is required to run to destruction.

The controller is usually monitored by a remote station, achieved by remote contacts within the controller. Such signals that are monitored include: engine running, engine failed to start and fault on engine or controller. There is also an audible alarm located on the controller that may be silenced in certain conditions.

NFPA 20 additionally specifies that the engine shall be started once a week automatically via a weekly start timer in a test mode.

Electric Motor Driven Fire Pumps

The main components in a NFPA20 electric motor controller are:

Isolator switch	Sized >115% FLC (Full load current) of motor
Contactors	Either Direct on Line or Star Delta (horse power rated)
Circuit breaker	sized to >115% FLC of motor.

Logic circuit with various monitoring channels

Emergency start mechanism for starting when the control circuit has failed

The circuit breaker is defined in great detail within the standard NFPA20. The principal points covered are:

- Non-thermal over current sensing type
- Instantaneous trip facility, which must be set <20 times FLC
- To have a tripping time between 8 and 12 seconds at 6 times FLC
- Be able to hold 300% FLC indefinitely.

The standard defined lamps are named 'power available' and 'phase reversal'; however, controller manufacturers offer other functions as options. Any alarm must not prevent the motor from starting.

Other Fire Pump Standards

When FM is not the insurer, then the building can be protected by a fire pump that is manufactured to local rules. Most countries throughout Europe have their own set of standards:

COUNTRY	STANDARD	CONTROLLER APPROVAL NEEDED
U.K	LPC	None
Holland	VAS	None
Germany	VDS	Yes, diesel and electric
France	APSAD	Diesel Engine controller must be approved. No approval needed for electric controllers.
Italy	UNI9490	None, just compliance.
Belgium	NVBB	Diesel Engine controller must be approved. No approval needed for electric controllers.
Spain	CEBREVEN	None
Europe	CEA	None

Local Rules Electric Controllers

Most of the standards have common elements between them and there are also similarities to NFPA20. The biggest difference is in the electric motor controllers and the protective device. NFPA20 calls for a circuit breaker but all of the above local rules specify a fused isolator. The fuse in this instance, generally speaking, must be able to carry the stalled motor current for a period of not less than 75% of the time needed for the motor windings to fail and thereafter be able to carry the normal current plus 100% for a minimum of 5 hours.

Local Rules Diesel Controllers

There are many differences in the rules for diesel engine controllers. The main differences are surrounding the automatic cranking sequence. For example, with LPC and VAS, all automatic cranking is done from one set of batteries and after each automatic start a manual start is required from the other non- automatic battery. With NVBB and APSAD, the crank sequence is more like the NFP20 specification. Most of the local rules for diesel controllers do not have any kind of weekly automatic test start functions.

Generally

To complicate matters further, some people prefer to use NFPA 20 as the basis of the fire pump, but do not have it approved by FM. In this mode, the set is referred to as UNLISTED and is a lower cost option to the FM approach. There is also a CEA specification available that is for the whole of Europe, but each of the individual countries appears

Pic courtesy of Metron Eledyne

to be reluctant to take it up at this time.

Future Trends

Due to diesel engine developments, and also as a result of rapid developments in information technology, the whole field of fire pump control is likely to change dramatically over the next few years. Already we are seeing the change to electronically controlled diesel engines for industrial applications. This has come about due to the various World standards limiting emissions from diesel engines, but brings with it benefits in terms of higher levels of information from the engine systems. This when integrated with the advances in the controller systems will enable far more capability for remote monitoring and management of the fire pump system. International Companies with operating bases spread throughout the world, will be able to monitor both the operating characteristics and service requirements of their fire protection equipment from anywhere via the internet, and receive fault notification by means of e-mail or text message to their service personnel. Engine and Controller manufacturers will be able to undertake remote fault analysis from their factories, and guide on site maintenance staff to a correct repair solution, without the need to send specialised service engineers jetting off to far flung corners of the world.

> Technically these advances are currently possible, but at this time fully electronic diesel engines have not been accepted for Fire Pump operation.

Special considerations attending pierside ship

By Anthony M. DiSanto, P.E.
& Andrew T. Grenier, P.E.
Rolf Jensen & Associates, Inc.

Pic courtesy of RJA Group, Inc.

Fighting a fire on a ship introduces challenges, which may differ from those encountered while fighting structure fires onshore. This article describes some of these challenges when a ship is tied-up alongside a commercial marine pier. This includes large cargo vessels and passenger vessels, which operate under international law. This distinction is made because small vessels engaged in coastal trade or on inland waters generally follow a different set of regulations, which may vary widely, depending on the regulations enforced by the country or local jurisdiction having responsibility for those protected waterways.

To understand the layout of a commercial ship, the machinery design, and the firefighting capabilities of the crew and its equipment, an understanding of the applicable maritime regulations is needed. Municipal Fire Departments which are near port facilities should familiarize themselves with the International Convention for the Safety of Life at Sea (SOLAS), which is written and maintained by the International Maritime Organization (IMO), a specialized agency of the United Nations. The SOLAS regulations outline the classification of ships, construction and machinery requirements, the requirements for life saving equipment, communications equipment, and the fire safety systems and fire safety design goals. A basic familiarization of SOLAS, coupled with a walkthrough of a commercial ship, will add significantly to one's understanding of marine practices, and what is to be expected when responding to emergencies onboard.

SITE ACCESS & PLANNING

Access to marine facilities is often restricted for security reasons. Some facilities have very tight security, often with a secondary security perimeter, which separates the actual pier side area from the remaining portion of the facility. The local fire chief should have a pre-incident plan established with each facility operator in the department's area of responsibility. This should include discussions regarding entry points, pier access, pier load capacity, pier firefighting equipment, water supply, pier electrical distribution system, and the facility command structure. Many larger facilities, especially marine oil terminals, will have their own fire brigade, the capabilities of which should be well understood by the local fire department.

The fire department should be familiar with the type of vessels normally docked at facilities in their area. Cruise ships are slightly more capable of handling their own fire emergencies because they have a

Pic courtesy of RJA Group, Inc.

for municipal firefighters board emergencies

significant number of crew onboard at all times. This crew is often marginally experienced but extremely helpful for those shore side firefighters attending an emergency. Cruise ship operators understand the magnitude of their life safety responsibilities and are typically very receptive to outside assistance, either in port or at sea.

The case may be different on large cargo vessels at a city pier or a small marine facility. The crew is very small, the ship is relatively large, and there is usually no coordinated assistance. Complicating the situation is the potential language barrier. The captain of the vessel and the senior watch officers often speak English as a second language. The IMO requires that the crew have a "common language" to facilitate internal communications and the crew will always be able to communicate with the local ship's agent.

FIRE CONTROL PLAN & COMMUNICATIONS

Immediately upon arriving to the vessel, the responding fire fighters should obtain the vessel's "fire control plan", and establish an on-site command station. Establishing on-site command and communications is typically not a problem for a cruise ship because there is always a senior crewmember at the access point to the vessel. For cargo vessels, this may vary with the ship and the person on duty, although they should typically be stationed near the access to the vessel. All ship's crews rely almost exclusively on handheld radio communications, usually marine handheld VHF radios. The senior person is usually a deck watch officer with decision-making capability, but with a heavy reliance on the engineering crew to handle ship systems and fight fires.

The fire control plan is required by SOLAS to be located near the access point to the vessel. It is usually mounted on the exterior of the ship superstructure in a weatherproof container, and must be marked. The fire control plans provide details on the ship layout and critical shipboard systems. Arriving fire department personnel should review these fire control plans immediately upon arrival to the scene. IMO guidelines stipulate what information should be on these plans, where they should be located, and the format of the symbols used. The plan is intended to be user friendly and in a format intended for use by responding shore side firefighters.

ELECTRICAL & FIRE MAIN SYSTEMS

Electricity and fire main water pressure are two systems of immediate concern to the arriving firefighters. Often, marine facilities request that the arriving firefighters provide water pressure to the ship fire main system, and nothing more. This arrangement simplifies the separation of duties but will only work for those vessels with well-trained crews, and for small emergencies. The local firefighters should plan on a more elaborate response. Local fire departments near marine facilities should have on hand their own "international shore connection" and appropriate fittings. All commercial vessels, which comply with the international regulations, will have this type of fitting specifically for this purpose. The international shore connection is intended solely for the purpose of allowing the local fire department to connect to the vessel's main fire system. SOLAS contains the standard dimensions of this flanged connection.

Marine facilities usually have standard services piped along the pier for connection to the ship if so desired. This may include fire main water, potable water, electricity, and sewage disposal. Commercial vessels, which seldom stay pierside

> *The international shore connection is intended solely for the purpose of allowing the local fire department to connect to the vessel's main fire system*

Pic courtesy of RJA Group, Inc.

Special considerations for municipal firefighters attending pierside shipboard emergencies

for more than a day or two, usually make no connections except to fill fresh water tanks.

Attending firefighters should be extremely careful when relying on the ship's fire main system and fire hoses. System pressure cannot be guaranteed by quickly opening a hydrant. These systems often have residual pressure and a substantial static head pressure from the complicated piping which leads up to the highest level of the ship. The result is that a hose line may discharge at what appears to be system pressure for almost a minute or two and then suddenly start to fall off. This is obviously a bad situation for the firefighter who is about to progress toward the fire with a hose line on a lower level of the ship. The fire main system on a ship his heavily segregated and the valves are seldom supervised. Although there are standards for fire hoses, the quality and maintenance of such hoses may vary greatly from what the fire department is used to. The system on a cruise ship is generally more reliable than on a cargo ship. In all cases, the more the fire department can provide it's own water and equipment, the less surprises there may be.

Electricity is perhaps one of the least reliable systems onboard a ship. Commercial ships usually do not take electricity from the pier and will generate their own. This requires leaving their emergency generators in the appropriate standby

If at all possible, keeping the lights on and power available to the electric fire pumps can be extremely helpful

mode as a back up while the ship's main generators remain in operation. The electrical distribution system is normally controlled from one of the machinery spaces where the main switchboards are located. In the past, shutting off electrical power was often considered necessary for the safety of the firefighters; however, historical information shows little support for this concern. If at all possible, keeping the lights on and power available to the electric fire pumps can be extremely helpful. With the exception of an atrium on a cruise ship, there are typically no windows, which will provide adequate light without the normal ship's electrical lighting. The emergency generator is normally located near the stern or on one of the highest levels in the deckhouse. Transfer of power should be automatic.

BASIC SHIP CONSTRUCTION

All ships are divided vertically by "decks". Below the "main deck" all ships are subdivided by watertight bulkheads. The system of doors through these bulkheads can be quite formidable and dangerous to traverse with equipment. SOLAS stipulates the requirements for these doors. Many of them are horizontally sliding, constructed of heavy steel and operated by hydraulics. This leads to a problem when laying hose lines. Ideally, the primary and secondary hoses used by the firefighters should come from the same subdivided zone or compartment of the ship to reduce the complications of crossing such openings with hose lines. However, this is usually impractical because the movement of smoke and hot gases usually requires firefighters to advance lines from a relatively remote location. Fighting a fire below the main deck is analogous to fighting a fire in a building below grade. It can be a potentially dangerous task based on the enclosure of the structure. The location of the main deck and the implementation of watertight

Pic courtesy of RJA Group, Inc.

doors below this level should be clearly identified on the fire control plans, which should be reviewed on arrival as discussed above.

Above the main deck, subdivision is less structured. Cruise ships use "main vertical zones" to completely divide the ship into lengthwise segments. These zones also subdivide all ship emergency systems and are designed to provide the maximum level of inherent fire separation, similar to a firewall between building occupancies. Cargo vessels generally provide subdivision between the cargo areas, the machinery spaces, and the accommodation spaces. The doors above the main deck are usually fire doors and are sometimes fitted with "hose ports" where required by SOLAS (in cruise ships). Hose ports assist in laying fire hose across these boundaries while trying to maintain integrity of the fire boundary.

SPECIALIZED TACTICS

Fire ground tactics used for a typical structure on shore may be catastrophic if used on a vessel. For example, the "surround and drown" tactic of directing as much water as possible onto a large building fire will be ineffective in a ship fire, and may lead to more problems such as flooding and loss of vessel stability. The most practical method of firefighting on a vessel involves isolating the fire to the compartment of origin, cutting off ventilation, cutting off fuel sources (such as fuel oil piping and/or electrical power), and cooling the compartment boundaries. It is imperative to understand the special hazards that may exist on ships, and the systems installed to handle them.

Most ships have a few hazardous locations near the bow and the stern, which hold flammable liquids, paints, solvents, or oils. These spaces are usually protected by installed suppression systems such as halon, CO_2, water sprinklers, or water mist systems. The suppression systems are activated manually. Although the activation of the systems is generally reliable, problems in sealing off the ventilation openings can lead to ineffective suppression and manual firefighting efforts are often required. In either case, because the structure is steel, fire boundaries should be established on all sides and above the space and cooling the boundaries is important to reducing the spread of fire.

On any ship, cooling of the boundaries of the fire compartment is one of the primary objectives of fighting a fire. The problem is in identifying the fire compartment. Without windows or openings, which show the extension of flames, it can be nearly impossible to determine which compartment is burning. This is compounded by the fact that many ships are not outfitted with fire detection that

Special considerations for municipal firefighters attending pierside shipboard emergencies

would indicate which compartment is on fire. As the heavily compartmented structure fills with smoke and trapped heat, investigation and suppression becomes extremely difficult. This is where use of the main subdivision scheme becomes very useful and this is why it is so important for the firefighters to review the fire control plans prior to organizing an approach to dealing with the emergency.

Cruise ships, which rely on the inherent safety of structural fire protection, use a significant amount of thermal insulation of the steel boundaries. This insulation often provides one hour of protection, similar to the building code procedure of rating building structural elements. Without the insulation, fire can pass from one compartment to another through a solid steel plate subdivision, via conduction heat transfer, as if the boundary were not present.

All ships have a main machinery space, which is divided from the rest of the ship by one hour rated fire divisions. Fighting a fire in this space is extremely difficult and dangerous. Machinery spaces are basically arranged the same with similar machinery systems on all ships, so firefighting procedures in this space can be standardized. The local fire authority should become familiar with the systems and hazards in machinery spaces.

Machinery spaces have at least one form of installed fire suppression system, typically a gaseous system such as CO_2. These systems are always activated manually and firefighters entering a machinery space during or after a fire should never do so without a breathing apparatus, because the discharge of such a system would be lethal to those persons in the space. If a firefighter becomes disoriented in a large machinery space, emergency exiting is best accomplished by going through the control room. A second, more general option is to move towards one of the upper levels. Lower level exits are usually fitted with heavy, complicated

Pic courtesy of RJA Group, Inc.

watertight doors, which may be difficult to operate in an emergency. In addition, doors at lower levels often lead into shaft tunnels or adjoining fuel oil pump rooms, which are not safe alternatives for an unfamiliar occupant.

Ships with diesel/electric or steam turbine propulsion systems usually have two machinery spaces while diesel and gas turbine propulsion plants have a single large main machinery space. Fuel oil, lubricating oil, and electrical fires are the most common hazard for these spaces and the amount of toxic smoke and heat is extremely dangerous. Oil fires become very intense almost immediately. However, with appropriate actions, they can be extinguished almost as quickly. In this case, reflash protection is essential and re-entry by firefighters is very dangerous until the space has cooled. This is especially essential in the event that CO_2 was used. The vessel's chief engineer would be the most knowledgeable person regarding the use of the CO_2 system, either in the machinery space or cargo spaces.

With so much subdivision, the ventilation of compartments relies almost completely on mechanical systems. This has the potential complication of spreading smoke quickly and confusing the firefighting effort. On the other hand, the ventilation system can be used to great advantage in starving the fire of oxygen and reducing it to a smoldering condition. Traditionally, this has resulted in a rather stubborn fire scenario. The fire, starved of oxygen, will smolder inside the complicated network of compartments, and the firefighters will have a difficult time finding it and accessing it. Ship fires have been known to burn for days this way and the result is a high demand on firefighters' time and equipment resources. Under these conditions, a good supply of breathing apparatus and additional bottles cannot be understated.

Although fighting fires on ships will present unique challenges to municipal fire departments, the most practical method of preparing for shipboard emergencies is familiarization. Most of the challenges can be foreseen since ship design, layout, and system operation are generally similar amongst vessel types. Commercial vessels, particularly cruise ships, which are at their "homeport", will usually offer vessel familiarization and training to the local fire department. This training, along with regular ship visits and pre-incident planning, will greatly improve the response and effectiveness of the firefighting effort, and will reduce the possibility of a firefighter being injured when responding to shipboard emergencies.

Cruise ships, which rely on the inherent safety of structural fire protection, use a significant amount of thermal insulation of the steel boundaries

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Tunnel Questions?

By David Lane. MIFireE

Inside Kaprun tunnel post the fire, showing the extent of damage caused by a fully developed fire.
Pic courtesy of ASTV video

What's the Problem with Tunnels?

All tunnels can become a fire related problem sometime in their long lives – a relatively straightforward assumption? Asks David Lane. Given the track record for firstly road tunnels – in January 2000, AIT/FIA (the European motoring organisation) commissioned Deutsche Montan Technologie GmbH (DMT) to perform a second tunnel test survey. A total of 25 tunnels were examined in eight European countries. The report stated in amelioration that compared to open roads and motorways, the risk of accidents in road tunnels is minor. Statistics showed that fewer accidents happen in tunnels than on open roads. This is primarily due to the minimum effect of weather conditions, to speed limits, steady lighting conditions, as well as the low number of junctions/links in tunnels. However, even small accidents are difficult to manage in tunnels, particularly for rescue personnel (ambulance personnel, fire brigade, police etc.) by having very restricted access. Accidents resulting in fire can lead to a disaster – as events in Montblanc, Leinbach and Tauern Tunnels demonstrated.

Next, railway tunnels, after these devastating fires, safety standards in Swiss tunnels (both road and rail) were the subject of a detailed study conducted on behalf of the Department of the Environment, Transport, Energy and Communications (UVEK). In 1999 the Federal Transport Office (BAV) launched a further study related to safety in rail tunnels. Their analysis of rail tunnels showed:

- 16% of the 689 tunnels reviewed were rated as having safety problems – a staggering 110 tunnels
- In 26 tunnels, most of them over 3000 metres long, the BAV also considered additional measures to be warranted with regards to facilities for rescue. These included:

  a. footpaths and handrails
  b. lighting (emergency)
  c. ventilation
  d. marked escape routes.

The past few years have seen an appalling succession of major fires in tunnels with casualties, some being:

1995	Baku Subway	289 dead
1996	EuroTunnel	0 dead
1999	Mont Blanc	39 dead
1999	Tauern	12 dead
2000	Kaprun	155 dead

A Fogtec high pressure water fogging gun in action on a test fire.
Pic courtesy of Fogtec Gmbh

THE PROBLEM?

In fire conditions the firefighter/engineer/safety manager knows that the rate of heat release, the smoke and gas concentrations and rapid fire propagation creates an environment dangerous to human life. Carbon monoxide and "hazmat" generation in fire effluent can rapidly reach dangerous levels. Tunnels are designed in so many shapes, curves and elevations between portals. Many parameters impinge and weather conditions; traffic density and traffic speed are important factors in a fire's cycle. We are all aware of the risks connected to the transportation of dangerous materials like flammable liquids and chemicals, and it is common knowledge that flammable gasses and vapours can form explosive mixtures when mixed with air. However, it is less widely recognized that every day materials such as flour, coffee, sugar, cacao and milk powder could form dust clouds, which are liable to explode with serious consequences. It is also important to consider HGVs transporting materials like wood pallets; wood chips and different plastic products, which are not in themselves considered dangerous, but

Pic courtesy of Securiton AG

will in a fire situation, represent a considerable additional fire load. Commonly transported by road or rail vehicles. The German BIA report "Brenn und Explosionsgrossen von Stauben" showed that a dust explosion can occur if a cloud of combustible dust is ignited by heat application, flame or spark – small amounts of energy being sufficient to start an explosion, typically > 10mJ. Also the pressure wave arising from an initial explosion can raise a much larger dust cloud, which can then fuel a catastrophic secondary explosion.

Tunnel fires can generate massive amounts of destructive power, conditions are ideal for smoke spread, rapid increases in radiated heat, and – the much-feared "flashover", this explosive spread of fire, consuming all human life in its path – easy to conjecture, those fleeing and those entering to assist along only bi-longitudinal pathways.

Do we now agree that "inhabited" tunnels, instead of say unstaffed cable or machinery tunnels, particularly those used for transportation and especially road transport tunnels are considered a very high fire risk, often with serious consequences? What do we do about them?

OUR RESPONSES?

If it's an existing installation usually the first task is to assess and reduce risk, using 'Fire Risk Assessment' (FRA) techniques. Mainland Europe provides a good definition, if we're hung up at this stage on the hook of finances – as most projects are, as to what are tolerable and intolerable risks. These are to be found in the ALARP Region, where risks "As Low As Rationally Possible" (ALARP) become acceptable to society. Figure 1 demonstrates. The FRA should identify and carefully examine the dangerous situations/procedures/substances etc. present in the tunnel(s) complex; the activities involving those processes and how they might fail dangerously so as to give rise to fire, explosion and similar events with the potential to harm. Its purpose is to enable tunnel operators to decide what they need to do to eliminate or reduce to as far as is reasonably practicable the safety risks from these dangers. In addition to enhancing 'Life Safety' the FRA and a 'Societal Risk Assessment' can have "added value" benefits – minimizing damage, protecting property and processes, safeguarding the market share, and, one we can all identify with, protecting the environment. Not least "justifying" to one and all the all too important expenditure.

For the new build we can carry out a 'Qualitative Design Review' (QDR) for the proposed tunnel (or those to be altered). During the QDR the scope and objectives of the fire safety design are defined, functional performance criteria established and potential design solutions proposed – usually an acceptable 'fire engineered solution' can be formulated. Using IT we can subsume 'Fire Modelling' and 'Fire Development and Zone Model' techniques to inform judgements. We can also for new and existing tunnels look at 'Human Behaviour within Fire Safety Systems' to bolster fire planning and procedures. The purpose of the QDR being to establish the fire safety issues for the 'workplace' – the tunnel in this case under UK law – the Fire Precautions (Workplace) Regulations 1997 (as amended), and to take account of the appropriate areas within the following main criteria:

1. perform a characterization study of the premises, environment and occupants
2. establish the fire safety objectives
3. establish an evacuation strategy
4. identify acceptance criteria
5. identify fire hazards and possible consequences
6. specify fire scenarios for risk analysis
7. prepare a fire safety manual for use on occupation

then to output these results as a proactive set of sequences to "control" the risks.

FIRE SIZE?

If you are responsible for designing a road or rail tunnel to minimise risk from fire, what features should you include? What objectives should be set? A full response to these issues should consider many questions unrelated to fire, but we are only considering fire here. An elementary issue is the size of fire from which protection is to be provided – the 'fire design size'. There are several approaches to this question, but let us consider only one possibility. Namely to design for the largest fire that may reasonably be foreseen. This hypothesis prevents you "knowingly" designing a tunnel that could become a death trap even when all systems function as well as possible in a foreseeable event. This is a powerful argument and it requires little trumpeting even though there is some difficulty in determining suitable limits to "foreseeable". In practice, it appears commonly interpreted as implying a fire power in the region of 30 MW-100 MW.

Pic courtesy of Securiton AG

STEPS TO BE TAKEN?

The provision of effective measures against the outbreak of fire is a tremendous challenge. It requires imagination and great expense. The 'Steps to be taken', in the parlance of risk assessment, to perhaps include fire suppression systems at the key risk areas or throughout, a fibre optic cable heat detector based computerised fire warning system or at the least an effective fire warning system, visual monitoring security systems, emergency and primary lighting, signs – emergency, instructional and directional, leaky feeder radio communications, personnel trains or vehicles for emergency logistics support and onsite incident command room(s), powerful ventilation system(s) to control heat/smoke release rates or allow escape, multiple escape route(s) enabling rapid egress or access for first responders. Detailed plans for rapid-response actions by staff will need to be developed and regularly tested and updated. This implies a major commitment of resources and certainly justified in some cases.

FIREFIGHTING MATTERS?

Water, for now, remains the best fire-extinguishing agent. The challenge is extinguishing fires with extremely small amounts of water to enhance efficiency in all directions. Water has such a unique ability to absorb heat – 2,253 Mjoul/sec at 100°C. By creating small water droplets the cooling surface area is larger, more water is in contact with the heat, less water is needed and the fire is extinguished and inerted much faster. Investigations from fires in the above list and others indicate that lessons are to be learnt about fire fighting techniques and equipment, ventilation system controls for fire fighting, good robust communications requirements especially between Regional or National fire brigades, robust water supplies for firefighting, extensive preplanning being vital particularly to ensure sufficient personnel and equipment are provided for the fire attack when its needed.

Ever more innovative and technological appliances appear in the armoury for fire attack utilising small water droplets technology. The Turbo-extinguisher has demonstrated its effectiveness and practical capabilities in many operations of firefighting and controlling clouds of harmful gases. It is an example of a development

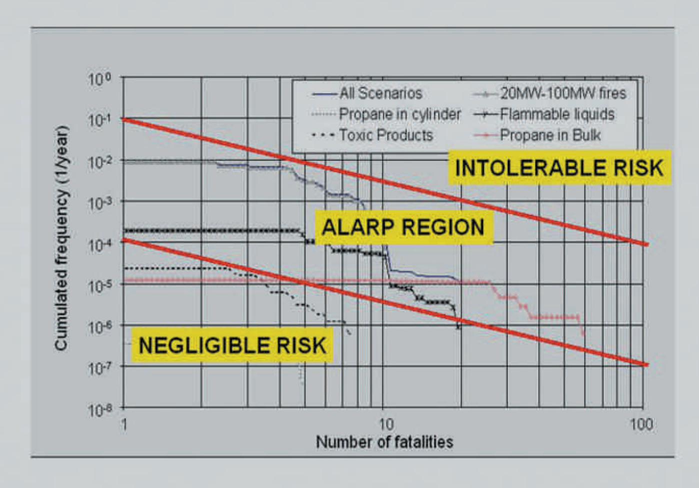

Figure 1. ALARP diagram – showing the ALARP region, the economically viable zone that falls between – Negligible Risk and Intolerable Risk.
Pic courtesy of Prof. Hermann Knoflacher, Vienna

from "a theoretical application – to a practical purpose" and can play a part. There are high velocity water Impulse Guns and cannon which can be mounted onboard fire trucks (and helicopters) and as fixed or semi fixed fire-extinguishing installations. There are portable and fixed fire suppression very high-pressure fog guns for firefighters. Together with fixed installation Firefighting Fogging Systems. Both cannon and guns are capable of being used in combination with any water based foam and bio additives to enhance properties where appropriate, making the maximum use of precious water supplies.

LIFE AND LIFETIME FIRE SAFETY?

Life for us is precious and we should use all our human endeavour, patience, attention to detail and environments, and skills shaped on the anvils of bitter experiences at tunnel fires to prevent loss. We have foreseen it now, the unthinkable happens, so we can stop it – this unconscionable roll of tragedies.

Proper measures must be taken, tunnels must be constructed to ensure accessibility for the rescue squads and fire fighters having safe escape routes. The enthusiastic and skilled designers and engineers who develop these systems do not and cannot retain control or involvement over the time-scale of perhaps 100 years or more. They must do their utmost to ensure that the systems they are installing will last. Victims of fire from bad design and constructions cannot be accepted. Systems should ensure a fire would have minimal impact and be attacked at incipient stage, and allow evacuation that offers safe exits from danger. Therefore fire suppression systems should be installed that "guarantee" to increase and sustain – the 'tenability time limit' – the period for escape. Firefighting matters!

Research and testing underpins the tremendous effectiveness of fixed installation very high-pressure water fogging systems, this "cutting edge technology", that has rapid cooling and fire suppression effects, immediately reducing fire and smoke so people escaping and emergency staff responding alike can breath safely. Then one can only conclude that all tunnels should be so provided with these systems?

LONGEVITY?

However impressive, sophisticated or technological the fire safety systems appear at the onset of a tunnel project. Can these same systems continue to work and be available at any time in the lifetime of the tunnel? These systems, and the management tasks that support them, must be viewed from this perspective if tunnels are to remain safe for our nations, employees, first responders, transportation of goods, the travelling public and the staff who tend them. That's the problem question for Tunnels.

REFERENCES

1. AIT/FIA (the European motoring organisation). Concept 2000 – Tunnel Test by Deutsche Montan Technologie GmbH (DMT). January 2000.
2. Alan Vardy. Tunnel Fires, Tunnel Safety and Human Fallibility. FEJ. July 2001.
3. F. Steur Sr. Fire Protection in Road Tunnels. IFEX Gmbh 2000.
4. R. Haselhorst. BASF Gmbh. Turbo-E-xtinguishers a first report on experience gained. FEJ. March 2000.
5. JFL Lowndes. Lifetime Fire Safety in Tunnels. FEJ. May 2000.
6. Eurotunnel. Summary of the Eurotunnel enquiry into the fire on 18th November 1996. Eurotunnel 1997.
7. Department of the Environment, Transport, Energy and Communications (UVEK). Swiss tunnels – study of road and rail safety from fires. Federal Transport Office (BAV). 1999.
8. BIA. "Brenn und Explosionsgrossen von Stauben" report. BIA. 1999.
9. Fogtec Gmbh. Fogtec Fire Protection. Fogtec Gmbh. 2003.

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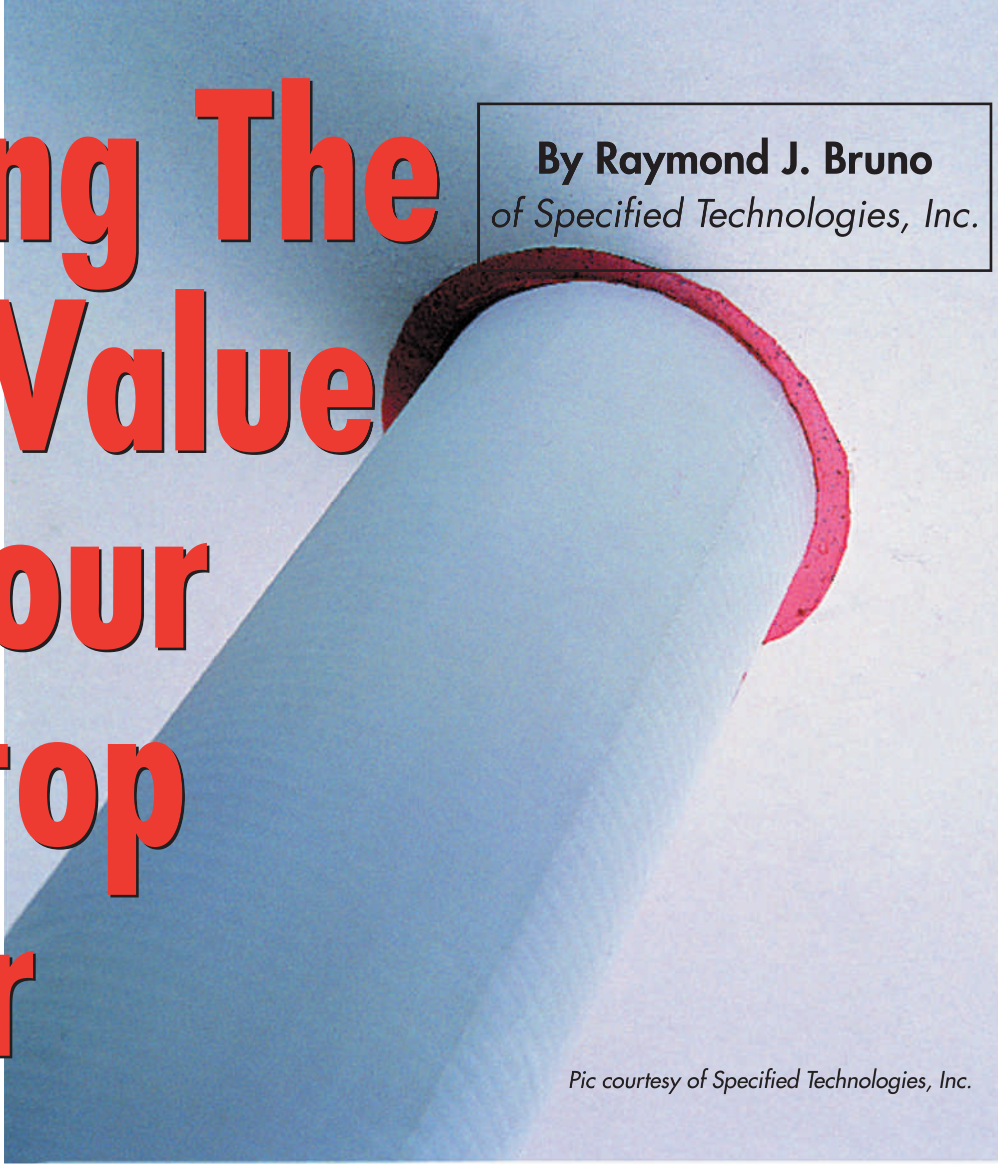
Heat, Flame & Smoke Detection For Tunnels

Getting The Best Value For Your Firestop Dollar

By Raymond J. Bruno
of Specified Technologies, Inc.



Pic courtesy of Specified Technologies, Inc.

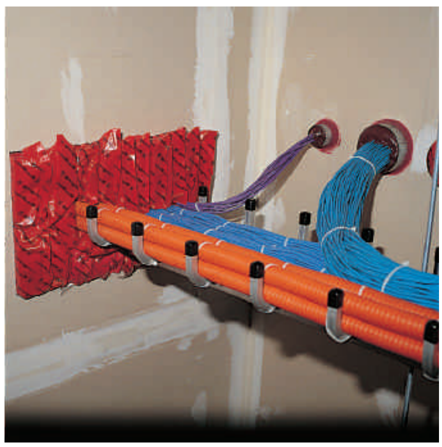
With many different firestop products and UL systems on the market how does a general contractor, construction manager, or building owner know they're getting code compliance at a fair price?

Open the UL Fire Resistance Directory and you will find at least sixty firestop manufacturers and over 3000 individual tested designs for various building service elements passing through fire-resistive rated barriers including floor/ceilings and wall assemblies. Add to that, various trades and specialty installers all claiming to be firestop experts. With all of these choices, how do you identify which is the best product for a particular application and who is the best choice to apply it? The purpose of this article is to provide guidance and direction on through-penetration firestop products, systems, and contractor selection that provides the best value for commercial buildings.

Say the word firestop and most of us think of *red caulk* being shot into all of the openings. In reality, there is a great deal more to firestopping than just shooting red caulk into a hole. Firestopping is a *system* rather than just a product. A firestop *system* consists of the barrier (the fire-rated wall or floor) being penetrated, the penetrating item (piping, cables, conduits, etc.), and the firestopping products and design used to seal the opening. This means that you are already making choices that affect your firestopping solution as you choose the wall or floor construction or decide how and where to route essential building services. A little time spent in advance choosing the right *systems* will not only make the initial installation easier and more cost effective, but may also continue saving the owner time and money over the life of the facility.

It's All About Value

Building owners want their money's worth. General contractors or construction managers who understand firestopping and address their client's specific needs provide added value. This gives them a competitive advantage over their competitors. Firestopping can be specific to the construction type or intended use of the facility. Data rich environments have their specific needs.



Pic courtesy of Specified Technologies, Inc.

Getting The Best Value For Your Firestop Dollar

Healthcare facilities have their own requirements. Firestop manufacturers armed with a complete system base will usually have the appropriate individual systems for the application. Those who do not have as complete a base will rely on systems designed for multiple applications. While this may sound fine, the problem with this approach is that such a system may be appropriate for one application but be complete overkill for another. Project firestopping cost suffers. Ensuring the appropriate systems are installed not only assures code compliance, but also eliminates cost overruns and costly job delays. It also affects fire barrier maintenance moving forward. Some general contractors and construction managers even record the firestop systems and locations during construction so the building owner or manager can more easily identify and maintain these fire barriers after the building is turned over.

To Caulk or Not to Caulk…

The red caulk unquestionably has its place. For permanent installations (ones that will not require subsequent changes) a permanent firestop product such as a caulk or sealant is often the right choice. Depending on the application, either an intumescent (expanding) or endothermic (heat absorbing) product is required. For large diameter plastic pipes an intumescent device known, as a firestop collar is required.

Data or telephone intensive facilities have their own unique criteria. In many of these facilities, the addition or removal of cables can be a regular occurrence. Choosing the wrong product in this environment can be a quandary that can cause headaches, down time, as well as additional recurring costs. The often-specified composite sheet type products are essentially a steel and intumescent sandwich. These products require field fabrication and are typically labor intensive to install. Composite sheet type products are an effective firestop for applications that will not be altered, however they are often installed without knowledge of, or consideration given to future re-entrance.

A Quick Re-Entry

There are products and systems available that maintain the life safety of the structure, while facilitating quick, easy alteration of the cabling system. We like to refer to them as re-enterables and recommend products that are *ready to install out of the box* without the need for cutting or alteration of any kind. Additionally, we prefer products that do not require tools or fasteners. Firestop putty and pillows fit that bill. Firestop putties represent a class of 100% solids, non-hardening products. They do not shrink nor do they harden like most caulks and sealants. Putty excels in applications requiring subsequent changes after installation. Most firestop putties are intumescent products meaning they will expand with heat or flames to help seal off combustible cabling jackets to prevent the spread of fire through fire barriers. Firestop pillows are *ready to install out of the box* and require no cutting, fastening or compression tools. Firestop pillows have all but obsoleted the older style firestop bags and foam blocks, which are far less resilient and require tools to install. Pillows typically consist of a fibrous core material encapsulated in an intumescent coating protected by a poly bag. The fibrous core material is resilient. It will rebound after being compressed to tightly fill and seal all void areas. The poly bag is slip-finished to allowing for easy cable retrofit by simply removing and re-inserting a single pillow at the cable interface. In the event of a fire, the product expands to form a hard-packed monolithic char that impedes the passage of fire, smoke and combustion byproducts. Many early UL systems utilizing pillows required that they be secured into the opening using a wire mesh. This requirement has been removed from many systems but may still be a wise choice in situations where the firestop is located in an exposed area subject to potential tampering.

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> *Ensuring the appropriate systems are installed not only assures code compliance, but also eliminates cost overruns and costly job delays*

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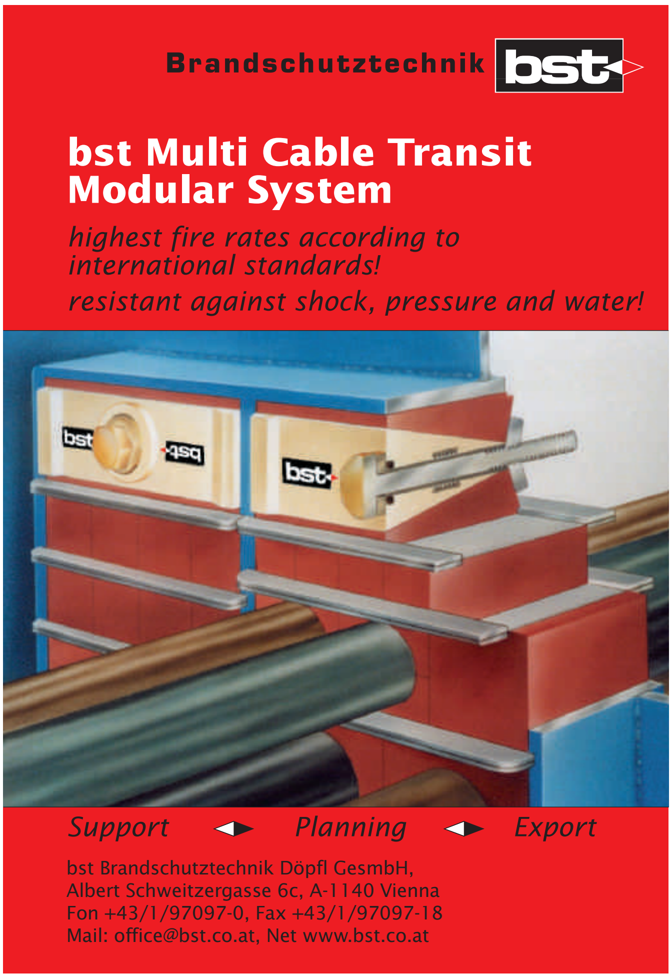

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Getting The Best Value For Your Firestop Dollar

cable pathways has evolved. Requiring no field firestopping, these new devices consist of galvanized steel casings lined with intumescent liners that function as an internal fire sealing system. The devices are square in shape, allowing them to be *ganged* together to increase cable-loading capacity within a given area. The devices allow 0 to 100 percent visual cable loading meaning the device is firestopped when it is first installed with no cables and sealed throughout the remainder of the building's lifespan. A 3 by 3 in. device has more cable fill capacity than a 4 in. conduit sleeve firestopped with caulk or putty. The square shape also allows for the cables to be installed more uniformly, leading to less unsealed interstitial space which equals a tighter seal against fire, smoke and other combustion byproducts.

Who Is Going To Do This Work?

Currently, firestopping is performed by all trades that compromise rated construction. Plumbers, insulators, electricians, etc. either perform firestopping or sub-contract it. If they are well trained and proficient there will be minimal problems. Many are not. In some areas there is a trend towards specialty firestop contractors. These dedicated contractors provide firestopping for the entire project. Many have taken and passed the recently developed Factory Mutual proficiency test. Since they are soley focused on firestopping, they are often more system and code savvy and can provide a one stop competitive answer to project firestop needs. It also simplifies and reduces the cost of managing the firestopping portion of the project. Another advantage is unlike other contractors; specialty firestop contractors remain on the job until completion and can tie up any loose ends that could delay a building's completion.

Knowledge Is Power

There is an old saying... *Knowledge is power*! This certainly applies to firestopping. You should not be totally reliant on others when it comes to the information that you will use to make critical firestopping decisions regarding your projects. To ensure that your company receives high quality, code compliant work, you must know how to ask for it and how to recognize when you have received it. Many general contractors as well as construction management firms have created a firestopping champion on their staff. This individual serves as the *go-to-guy* for firestop-related issues on the jobsite. This is a great idea. While you can't reasonably expect this person to know all 3,000 of those UL systems, he or she can be trained to know where to go to get the right answers when they are needed.

Comprehensive firestop training is available for virtually all aspects of this process. The FCIA (Firestop Contractors and Installers Association) provides training and certification methodology for installers. Courses are also available that provide AIA accreditation. Keep in mind that no one is better versed when it comes to firestopping then the leading

Pic courtesy of Specified Technologies, Inc.

manufacturers who have invested so heavily in the testing required for a full and complete, UL tested and Classified system base. They can be an invaluable source for training, technical assistance, and on-line information.

What's The Answer?

Early in my career I had a boss who was always saying things like "plan the work and work the plan", or failing to plan is like planning to fail". This is true for design-build. With the number of penetrations, systems and potential installers on a project it certainly applies to firestopping. Manage the firestop bid package. Evaluate the building type and intended use and standardize UL systems for the project. Standardizing puts you in control, reduces project costs and simplifies bid comparisons.

The hardest part of getting the best value for your firestop dollar is determining what you need and who should do it. Like most other things doing the hard work up front will make the rest of the project a whole lot easier.

You should not be totally reliant on others when it comes to the information that you will use to make critical firestopping decisions regarding your projects

Raymond J. Bruno is Vice President of Marketing for Specified Technologies, Inc.

Specified Technologies is a leading manufacturer of firestop products with over 600 UL listed systems. Headquartered in Somerville New Jersey the company has marketed their products nationally for over 10 years. Additional information can be found at www.stifirestop.com or by contacting the authors directly at 800-992-1180.

Voice Alarm

Dennis Terrett F Inst SCE, an independent consultant joined the public address industry during 1951. From then he has been involved with the development of voice alarm, being in the working groups for writing various Standards, including the BFPSA COP for voice alarm and BS 5839: Part 8: 1998. The intention of this article is to cover the main considerations of a total system from the interests of the user, installer, supplier, manufacturer and specifier.

Amplifier assembly providing a total power of 1.3 kW, manufactured by Baldwin Boxall Communications Ltd.

OVERVIEW

CONTRARY TO SOME THINKING, voice alarms have been in use for a long time and can be recognised as such in the 1939-45 war. Used to give alarm and direction in military establishments, as well as used for scrambling aircraft, also on fighting ships, submarines, tanks, the 'Tannoy' loudspeaker grille became a household name.

After that war it was appreciated that there was still a requirement for this application of loudspeakers and amplifiers, the resulting development for use in industry was rapid. This included not only warning systems for fire with selective zoned announcements, but also included chemical hazards and then bomb warnings. At the same time the majority of the new passenger liners were equipped with systems that combined the entertainment functions with the emergency broadcast facilities. The key word with all these applications is 'Communications'. This is where the sounder is no longer effective and speech is essential to achieve a quick response and action in the best direction.

STANDARDS

A number of standards exist, which have a direct bearing on VA systems. In many cases the specification for a project will demand compliance to most of them, whether they are relevant to that project or not. This is either due to laziness or ignorance on behalf of the specification author.

In the 1960s there were few standards with any relevance to public address when used as part of the fire alarm (VA). Then in 1988 the new version of BS 5839 appeared, recognising at long last that things could be done to advantage using loudspeakers and amplifiers. From then on the fight has been intense, with today's results being recognition of the importance of good communication in an emergency situation. In the meantime, in 1990, the London District Surveyors Association (LDSA), in conjunction with the London Fire and Civil Defence Authority, produced a 'Guide No 3 Phased Evacuation from Office Buildings'. This required the use of public address and formed the basis of some of the text in the standards to follow.

With the publication of BS 7443: 1991, a very poorly written document, only leading to confusion, BFPSA put together a team to write a 'Code of Practice for the design, installation and servicing of voice alarm systems associated with fire detection systems'. This was launched by BFPSA September 1994 and was adopted by BSI as the draft document for BS 5839: Part 8.

DSP Router By Application Solutions Ltd., providing automatic signal routing and fault warning, as well indication, with precise details given on an alpha numerical LCD.

The following list is of the most common standards relating to VA at this time:

BS 5839:	Fire detection and alarm systems for buildings.
BS 5839: Part 1: 2002	Code of practice for system design, installation, commissioning and maintenance. This supersedes BS 5839: Part 1: 1988, which was withdrawn 1st January 2003.
BS 5839: Part 8: 1998	Code of practice for the design, installation and servicing of voice alarm systems. Of all the standards this should be regarded as the most important for general use and should provide the means to conclude differences between standards, in favour of this one.
BS EN 54-2: 1998	Fire detection and fire alarm systems. Part 2. Control and indicating equipment.
BS EN 54-4: 1998	Fire detection and fire alarm systems. Part 4. Power supply equipment. There are other Parts in preparation; it is therefore recommended that readers familiarise themselves with the latest published Parts.
BS 6259: 1997	Code of practice for the design, planning, installation, testing and maintenance of sound systems.
BS 7594: 1993	Code of practice for audio-frequency induction-loop systems (AFILS).
BS 7807: 1995	Code of practice for design, installation and servicing of integrated systems incorporating fire detection and alarm systems and/or other security systems for buildings other than dwellings.
BS 7827: 1996	Code of practice for designing, specifying maintaining and operating emergency sound systems at sports venues. This standard is often accompanied by BS 5839; the main difference is the means by which the sports venues are required not to have the ability to simultaneously evacuate all areas, by one switch.
BS 8300 : 2001	Design of buildings and their approaches to meet the needs of disabled people.

	Code of practice. Section 9.3 refers to PA systems, including the testing by trials and the use of induction loops.
BS EN 50014: 1998	Electrical apparatus for potentially explosive atmospheres.
IEC/BS EN 60268	Sound system equipment. There are a number of parts, which are relevant to the equipment designer, in terms of the individual performance of component parts of systems as well as the total systems. The Standard is not specifically for VA, but PA also.
IEC/BS EN 60268-16	The objective rating of speech intelligibility by speech transmission index.
IEC/BS EN 60849: 1998	Sound systems for emergency purposes. This replaces IEC 849 and BS 7443.
IEC 61508: 2002	Functional safety of electrical/electronic/ programmable electronic safety-related systems.

Accreditation to BS EN ISO 9000 (9001 Model for Quality Assurance in Design Development, Production, Installation and Servicing) is considered by most as important and within this structure is the section for software, namely:
BS EN ISO 9000-3: 1997, Part 3. Guidelines for the application of ISO 9001: 1994 to the development, supply, installation and maintenance of computer software.

This includes the design control, including the design principals, together with the method of testing of software and maintenance, which should be taken seriously. In life safety systems this is most relevant and should an incident result in an enquiry, there could be serious consequences for the person responsible, if it is found that this has been ignored. This is reinforced by BS EN 61508: 2002.

LDSA Fire safety guide No 3 & update notes Phased evacuation from office buildings.

This advocates the use of public address systems to evacuate office buildings of six or more floors in the London region.

There are other standards, which could be included; however, they are common to fire detection and sounder alarms, or have little, if any relevance to the majority of projects. They are found in the numerous lists included in the various Standards documentation and a scan of them is always worthwhile to avoid overlooking something, which could be relevant in a particular case. It is important to be aware of

new and revised or replaced standards. Compliance with H&S, as well as EMC must apply. In this article 'Offshore' applications have been omitted as being a special case.

Compliance with the standards is a matter of agreement with all the interested parties. Where it is necessary to deviate, or to not comply, then this should always be documented. If there is an incident resulting in the loss of life, as a result of a VA system problem or failure, a court of enquiry would not be sympathetic to a negligent design or installation and one which did not meet the appropriate standards as expected. The thought of what answers to questions relating to compliance you would give to the coroner, is a relevant one.

AUDIBILITY AND INTELLIGIBILITY

Whilst audibility has been recognised as a necessary requirement for hearing alarms in an emergency condition and given as a minimum of 65 dBA, with 5 dBA above the background (ambient) noise level, there is a further factor in voice alarm systems; can you understand what the message is saying? This is where it is essential to be able to measure the level of intelligibility and specify the requirement.

There are a number of methods of measurements in use, some requiring listeners to write their perceived results from a carefully made broadcast, with others using electronic sound generators and analysers. Although the results are comparable there is in some cases risk of misinterpretation. In more recent times a hand held meter has been introduced and not only is the result produced in a shorter time (15 seconds.), but it seems to have advantages with regard to accuracy.

Most specifications call for an intelligibility level of 0.5 STI and in many cases that is not possible due to the acoustic environment. At the time of tender this should be made clear and agreed as to what can be produced. The main problems relate to background noise levels and reverberation. BS 5839: Part 8 recommends that the broadcast message is at least 10 dBA above the background noise level, to provide a satisfactory level of intelligibility. This should include smoke extract fans etc.

Examples of VA loudspeakers manufactured by Audio Design Services ltd. Common types shown here are horn, ceiling with a fire dome and bi-directional wall mounting.

AMPLIFIERS

There are centralised amplifier systems as well as distributed amplifier systems for large sites and in some cases large buildings. The principles are the same with the addition of a communication loop for the latter. This should comply with the Standards in all respects, sadly in the past that has not always been the case. Partial failure of the loop should not prevent full operation and full failure only affect the amplifiers between the breaks, during which time the affected amplifiers should operate from local control.

FIRE PANEL INTERFACE

The interface between the fire panel and the VA should be monitored by the fire panel, which should regard the VA as a sounder circuit. On initiation of the alarm the VA should latch until a separate command is given. This is to ensure that the alarm continues even if the link is destroyed in a fire.

FAULT MONITORING

Whilst there should be very comprehensive automatic fault monitoring it is only necessary to inform the fire panel that there is a fault, there being much more information on the VA equipment. Included in this fault monitoring are the loudspeaker circuits. A number of methods are used and some are much better than others. High frequencies that are not audible tend to be affected by the cable reactance and if used to measure the impedance are likely to give false information. Low frequency use can sometimes be heard due to the harmonic content. The most reliable method is to use DC resistance measurements, with end of line resistors. This is not affected by the cable types and continues during broadcasts.

In some systems the control and routing unit, which automatically directs the appropriate pre-recorded message and signals to the correct loudspeaker zones, also contains the fault monitoring control. The information can be very precise, with specific details, customised to the building, enabling speedy action to rectify any fault.

LOUDSPEAKERS

Loudspeakers should be constructed to meet BS 5839: Part 8. This is to ensure that even if the loudspeaker is in the fire, others connected to the same circuit in other areas will continue to broadcast. The main consideration is the type of terminals and the internal wiring, to prevent a short when subjected to 800°C, this includes mechanical protection. Caution is required when choosing loudspeakers for VA, are they compliant and will their performance give the required intelligibility? They may look good but perform badly.

USER RESPONSIBILITIES

Finally, it is the user that has responsibility for checking that the system is functioning. This includes daily, weekly and quarterly attention, not forgetting the training of personnel in the correct use of the system. This is detailed in BS 5839: Part 8.

GENERAL

This has been a brief insight into VA and it is hoped that an appreciation of the need to attend to the finer points, as well as to comply with the Standards is necessary. It is not wise to cut corners with life safety systems and the chances are that it will be found out, sooner or later.

FIRE EXTINGUISHER ROUND UP

By Ajay Gulati,
Rolf Jensen & Associates, Inc.

Kitchen Fire Protection

Pic courtesy of Thomas Glover Ltd.

Over the past fifteen to twenty years, changes in the cooking industry have resulted in several significant fire protection changes as a result of some increased hazards. These hazards have been created through the use of higher efficiency cooking appliances and the increased use of vegetable cooking oils.

In order for the cooking industry to meet the demand for faster food preparation, insulated high efficiency appliances were introduced. The older cooking appliances were either not insulated or minimally insulated. The newer high efficiency cooking appliances now minimize heat loss and use up to 25% less energy than older cooking appliances.

The introduction of vegetable cooking oils by the cooking industry has reduced health concerns associated with the use of animal fat based cooking oils. The new vegetable cooking oils have a lower percentage of fatty acids, whereas the animal fat based cooking oils have a high percentage of saturated fats.

These changes in the cooking industry have resulted in a re-evaluation by the fire protection industry to address changes in the special hazards that have been created. Resulting changes have taken place in both automatic fire suppression systems and manual fire extinguishers used in commercial cooking environments.

The new high efficiency cooking appliances heat cooking oil faster because of the improvements made to the heat exchanger. Cooking oils retain heat and cool more slowly because of improved insulation. In a deep fat fryer, for example, cooking oils and greases are typically heated to a temperature of 300° to 375°F in order to cook the food properly. However, these temperatures may be exceeded for various reasons in the cooking appliances. The temperature of the cooking oil may reach the auto-ignition temperature if this problem is not addressed.

The auto-ignition temperature of most animal fat based cooking oils ranges between 550° and 600°F. The auto-ignition temperature of most vegetable cooking oils is 685°F or higher. The higher auto-ignition temperature of the vegetable cooking oils results in a fire that is more intense and hotter than that of a fire involving animal fat based cooking oils.

The slow cooling of the cooking oils due to the insulation poses an increased risk of reflash after the fire protection system is discharged. Tests have shown that aging of the cooking oils results in lower auto-ignition temperatures. However, the temperature required for the cooking oil to reflash also decreases as the cooking oils age. Therefore, the more the oil is reused, the lower the auto-ignition temperature and the greater the risk of a fire.

A typical fire in a cooking appliance,

The primary means of protection is usually by an automatic fire extinguishing system, and the secondary means is by portable fire extinguishers

such as a deep fat fryer, often results from heating the cooking oil to its auto-ignition temperature. The fire continues until the temperature of the cooking oil is lowered below its auto-ignition temperature or the cooking oil has completely burned.

Most jurisdictions have adopted NFPA 96, NFPA 17A, and NFPA 17 through their building, mechanical and fire prevention codes to address problems such as fires involving restaurant cooking appliances. NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, requires commercial cooking appliances to be protected by a primary and a secondary means of fire protection. The primary means of protection is usually by an automatic fire extinguishing system, and the secondary means is by portable fire extinguishers. The automatic fire extinguishing system must now comply with the UL 300 Test Standard, *Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas*.

The first edition of the UL 300 Test Standard, which went into effect in 1994, used animal fat based cooking oil fires, in deep fat fryers, for the testing of the automatic fire extinguishing systems. A second edition of the UL 300 Test Standard was published in March 1996 to address the use of vegetable cooking oils and the risk of re-ignition of the cooking oils in high efficiency deep fat fryers. The changes to the second edition of the UL 300 Test Standard are as follows:

1. The minimum auto-ignition temperature for the cooking oils was increased from 650°F to 685°F to more closely resemble actual field conditions.
2. The one-minute pre-burn after auto-ignition was also changed to a two-minute pre-burn for the cooking oils in the deep fat fryer.
3. After the two-minute pre-burn period, the fire's heating source is turned off, and the automatic fire extinguishing system is discharged.
4. The time permitted for the re-ignition of the cooking oil once the fire was extinguished was increased from five minutes to 20 minutes or until the temperature of the cooking oil decreases 60°F below its observed auto-ignition temperature, whichever is longer.

In addition to the fire extinguishing test, splash tests are conducted to ensure that the operation of the extinguishing system will not splash burning cooking oils out of the fryer vat. Such splashing could result in spreading the fire and injuring an operator who is trying to manually extinguish the fire. The test protocol for the hood and duct protection was not otherwise changed.

All new restaurant automatic fire extinguishing systems manufactured after March 1996 must comply with the second edition of the UL 300 Test Standard or ULC 1254, *Pre-Engineered Dry Chemical Extinguishing System Units,* in order to receive a UL listing.

The two common automatic fire extinguishing systems protecting the cooking appliances are the pre-engineered wet chemical extinguishing systems and the pre-engineered dry chemical extinguishing systems. UL 1254 is used to determine if the pre-engineered dry chemical systems complied with UL test standards. The pre-engineered dry chemical extinguishing system units covered by the UL 1254 Test Standard are intended to provide protection for industrial total flooding protection systems, Class B local application protection systems, restaurant cooking area protection systems, automobile service station fueling area protection system, open-face paint spray booth protection systems, vehicle paint spray booth, and off the road vehicle protection systems. The UL 1254 Test Standard, Section 30, *Restaurant Cooking Area Protection System*, states that a dry chemical type extinguishing system unit intended for the protection of restaurant cooking areas shall comply with the UL 300 Test Standard. These pre-engineered automatic dry chemical extinguishing systems were once listed by the UL 300 Test Standard for use in protecting cooking areas before changes were made to the Test Standard in March 1996.

The chemical agents used in the

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pre-engineered automatic dry chemical extinguishing system consist of sodium bicarbonate and potassium bicarbonate. Sodium bicarbonate and potassium bicarbonate react with common cooking oils to form a soapy foam (saponification) created by the hydrolysis of fats contained in the cooking oils. The soapy foam floats on the cooking oil surface to create a blanketing action which prevents oxygen from reaching the fire and eventually results in extinguishing the fire. The dry chemical agents do not have significant cooling capabilities since water is not present in the dry chemical agents. The heat loss through the deep fat fryers is the mechanism for cooling the cooking oils below its auto-ignition temperature.

Wet chemical agents consist of potassium carbonate or potassium acetate and water. The water content is approximately 40 to 60 percent by weight and may vary by manufacturer. The pre-engineered wet chemical extinguishing system also creates a soapy foam (saponification), which prevents oxygen from reaching the fire and eventually results in extinguishing the fire. The water content of the agent aids in cooling and reducing the temperature of the hot cooking oils below their auto-ignition temperature.

The key difference between a dry chemical agent and the wet chemical agent is the method of cooling the cooking oil below its auto-ignition temperature. The dry chemical agents rely on the heat loss through the deep fat fryers whereas the wet chemical agents rely on the water contained in the mixture to remove heat from the oil and thus lower the cooking oil temperature below its auto-ignition point. The high efficient deep fat fryers retain heat because of the insulation.

Additionally, the higher temperatures associated with vegetable cooking oils contributes to the faster breakdown of the soapy foam layer created by the dry chemical agents. Therefore, the

The key difference between a dry chemical agent and the wet chemical agent is the method of cooling the cooking oil below its auto-ignition temperature

extinguishing capabilities of the dry chemical agents is reduced, and the probability of re-ignition is increased, whereas the wet chemical agents maintain the soapy foam blanket and allow cooling of the vegetable cooking oils to prevent reflash.

UL will no longer "list" a system when the appropriate service parts or agent for recharging are not available and cannot be maintained in accordance with the manufacturer's manual and NFPA Standards for the pre-engineered extinguishing system unit. Dry chemical extinguishing systems are no longer UL listed for use on cooking appliances because the manufacturers have either discontinued the system or the system does not meet the second edition of UL 300 Test Standard. However, dry chemical extinguishing systems are permitted to be used to protect hood and plenums above the cooking appliances since the second edition of the UL 300 Test Standard was not revised for the hood and plenum protection.

Portable fire extinguishers are intended to be used as a secondary means of protection for restaurant cooking appliances. NFPA 10, Section 2-3.2, Exception, states that extinguishers installed specifically for these hazards prior to June 30, 1998 may remain. Prior to June 1998, 40B:C bicarbonate-based dry chemical extinguishers were required to be installed and are still permitted by the Exception.

Similar to the dry chemical automatic fire extinguishing systems, the dry chemical fire extinguisher will extinguish a fire involving vegetable cooking oils. However, the dry chemical will not prevent re-flash of the vegetable cooking oils because of its inability to provide sufficient cooling of the cooking oils. As indicated in NFPA 10, testing has shown that wet chemical extinguishers have several times the cooking fire extinguishing capability of a minimum Class 40-B rated sodium bicarbonate or potassium bicarbonate extinguisher. This has led to the development of Class K portable fire extinguishers using wet chemical agents. The 1998 edition of NFPA 10 includes a new fire Class K, which is defined as "Fires that involve cooking appliances with flammable cooking oils and fats (vegetable or animal.)"

The Class K fire extinguisher is a wet chemical fire extinguisher which functions similarly to the wet chemical automatic fire extinguishing system. The wet chemical agents in the Class K rated fire extinguisher create a foam blanket when reacting with the burning cooking oil. The foam blanket also aids in cooling the cooking oil below its auto-ignition temperature, thus preventing re-flash.

Although NFPA 10 requires Class K rated fire extinguishers to protect *cooking appliances*, ABC multi-purpose dry chemical fire extinguishers are permitted in the *cooking areas*. The ABC multi-purpose dry chemical agent consists of monoammonium phosphate. The chemical agent, monoammonium phosphate, is effective on fires in ordinary combustibles (Class A), flammable liquids (Class B) (except heated grease) and in live electrical equipment (Class C). NFPA 10 indicates that the agent itself has little cooling effect and, because of its surface coating characteristic, it cannot penetrate below the burning surface. For this reason, extinguishment of deep seated fires may not be accomplished unless the agent is discharged below the surface or the material is broken apart and spread out. Therefore, ABC multi-purpose dry chemical fire extinguishers are not recommended for use on fires involving heated grease.

Monoammonium phosphate provided in ABC multi-purpose dry chemical fire extinguishers is acidic in nature. The wet chemical agents consisting of potassium carbonate and potassium acetate used in pre-engineered wet chemical automatic fire extinguishing systems are alkaline base. The material safety data sheet for potassium carbonate and potassium acetate indicates that the chemicals are incompatible with acids and any materials reactive with water. Testing by UL of Canada has shown that the monoammonium phosphate will break down the soapy foam blanket created by the wet chemical agents. This breakdown of the foam blanket may eventually result in a reflash.

A paper presented during the 1978 NFPA fall meeting concluded that only sodium bicarbonate, potassium bicarbonate and potassium carbonate agents should be recommended for deep fat fryer protection. Monoammonium phosphate, potassium chloride and potassium sulfate based agents should not be allowed in the vicinity of the deep fat fryer.

The automatic fire extinguishing system is designed to discharge only one time. The use of an ABC multi-purpose dry chemical agent on a fire involving vegetable cooking oils in deep fat fryers will not prevent re-ignition of the vegetable cooking oils. The possibility of reflash will hinder the fire extinguishing capabilities of the wet chemical agents should an occupant use an ABC multi-purpose fire extinguisher prior to the discharge of a wet chemical automatic fire extinguishing system.

There are two methods whereby a dry chemical agent can be discharged from a fire extinguisher shell, depending on the basic design of the fire extinguisher. Those include stored pressure or cartridge operated. The stored pressure type ABC multi-purpose dry chemical fire extinguisher is pressurized to 50 to 200 psi. Regardless of the type of fire extinguisher, stored pressure or cartridge operated, if the extinguisher is aimed at close range to a fire involving cooking oils, it may cause splashing. The splashing of the cooking oil may spread the fire beyond the hazardous areas protected by the automatic fire extinguishing systems.

The automatic fire extinguishing systems are tested in accordance with the manufacturer's manual and NFPA Standards. Any alterations to the specific guidelines provided in the manufacturers installation manual will affect the extinguishing capabilities of the system. Therefore, it is very important that the proper extinguisher be used as a secondary means for the protection of cooking appliances.

The use of appropriate fire extinguishers will require training of the occupants by the distributors of the fire extinguishers. Occupants should also be trained to manually activate the automatic extinguishing systems as a first line of defense prior to the use of any fire extinguishers.

REFERENCES

AISG, *Fire Protection Report, Kitchen Fire Protection and UL 300*, No. 64.10, April 1999, 5 pp.

The Ansul Company, Marinette, Wisconsin, *The Continuing Art of Fire Extinguishment, an Aid to SCORE*, 1973, 13 pp.

Fire Equipment Manufacturers' Association, Inc. UL 300 (11-94) *Restaurant Fire Protection Changes*, (questions and answers), 7 pp.

Fire Equipment Manufacturers' Association, Inc. *Statement on Class K Extinguishers*, July, 1999, 1 p.

Fryburg, George, *Review of Literature Pertinent to Fire-Extinguishing Agents and to Basic Mechanisms Involved in Their Action*, National Advisory Committee for Aeronautics, Technical Note 2102, May 1950

Gill, Susan, and Metes, W. S., Underwriters Laboratories Inc. *Report on the November 1, 1988 Meeting of Underwriters Laboratories Inc. Industry Advisory Conference for Extinguishing Systems*, Appendix C, 15 pp.

National Fire Protection Association, *NFPA 10, Standard for Portable Fire Extinguishers*, 2002 Edition, 58 pp.

National Fire Protection Association, *NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, 2001 Edition, 35 pp.

Stauffer, E. E., *The Testing of Class B Agents on Deep Fat Fryer Fires*, NFPA Fall Meeting, 1978, 14 pp.

Underwriters Laboratories Inc., *UL Standard for Safety for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas*, UL 300, Second Edition, March 29, 1996, 21 pp.

Underwriters Laboratories Inc., *UL Standard for Safety for Pre-Engineered Dry Chemical Extinguishing System Units, US 1254*, Second Edition, June 28, 1996, 58 pp.

Underwriters Laboratories Inc., *Subject 300, Meeting of Industry Advisory Conference (IAC) for Extinguishing Systems*, June 30, 1995, 31 pp.

It is very important that the proper extinguisher be used as a secondary means for the protection of cooking appliances

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Halon Alternative Fire Systems

By Kate Houghton, Marketing Manager Suppression Systems, Kidde-Fenwal Inc

Pic courtesy of Kidde-Fenwal Inc.

FROM THE MID 1960s Halon 1301 was the industry standard for protecting high value assets from the threat of fire. Halon 1301 had many benefits as a fire suppression agent; it is fast acting, safe for people, safe for assets and required minimal storage space.

Halon 1301s major drawback is that it depletes atmospheric ozone. The Montreal Protocol, introduced in 1987, spelled the demise of Halon 1301 and today the use of this agent is primarily limited to the aviation sector, some military applications and a small number of applications categorized as "essential use". The installation of new Halon systems is now rare and in almost all cases uses reclaimed and recycled Halon 1301 agent. This is due to an almost worldwide ban on the production of new Halon 1301.

A number of countries around the world have also taken steps to mandate the removal of installed Halon systems. Most notably these include Germany and Australia, the first two countries in the world to require this action. In both of these countries complete removal of installed Halon systems has been completed except for a very few essential use applications. The European Union is currently undergoing a similar mandated removal of installed Halon systems. Under EC regulation 2037/2000 since December 31 2002 installed Halon systems cannot be refilled if they discharge, and from December 31 2003 all Halon systems must be decommissioned (again with very few exceptions). Canada also has commenced a Halon phase out period. The "Canada Strategy to accelerate the Phase-Out of CFC and Halons Uses and to dispose of the surplus stocks" details the phase-out plans in place in Canada. For fixed suppression systems one system refill will be allowed between 2005 and 2010, on the condition that the system is replaced by an alternative within one year of refill. Starting in 2010, no refills of fixed Halon systems will be allowed.

The search for environmentally responsible Halon alternative agents commenced in the early 1990's. Manufactures looking to find suitable Halon replacements tested multiple agents in their quest to find an agent that would be an acceptable Halon replacement. The agent and hardware manufacturers were looking for agents that provided at least the same safety and performance as Halon 1301, that is the agent needed to be safe for use in occupied spaces, it needed to be safe for critical assets and be environmentally acceptable. Other factors such as storage requirements and overall cost of the system were also important in the selection of viable Halon alternatives.

In general the Halon replacement agents available today fall into two broad categories, in-kind (gaseous extinguishing agents) or not in-kind (alternative technologies). In-kind gaseous agents generally fall into two further categories, Halocarbons and Inert Gases. Not in-kind alternatives include such options as water mist or the use of early warning smoke detection systems. A table of the more commonly used alternatives is shown below.

HALOCARBONS

Halocarbon agents are similar in many respects, although each agent has some

Halocarbons	HFC-227ea (FM-200, FE-227)
	HFC-23 (FE-13)
	HFC-125 (FE25)
Inert Gases	IG 55 (Nitrogen/Argon blend – Argonite)
	IG 541 (Nitrogen/Argon/Co_2 blend – Inergen)
	IG-10 (Nitrogen)
	IG-01 (Argon)
Not In-kind	Water Mist
	Early Warning Smoke Detection
	Pyrotechnic Aerosols

Pic courtesy of Kidde-Fenwal Inc.

subtle differences. Halocarbons are active agents that extinguish fires by directly interacting with the fire itself. This mechanism employs similar chemistry to Halon 1301. All of the Halocarbon agents are electrically non-conductive, most require some form of super-pressurization with nitrogen, most require both more agent on a weight basis than Halon 1301 and more storage space than Halon 1301. Each of the Halocarbon systems has a typical discharge time of ten seconds, providing rapid discharge and consequently rapid extinguishment. By far the most popular halocarbon agent is HFC-227ea (trademark FM-200 or FE-227). FM-200 has an estimated 100,000 installations in more than 70 countries around the world.

INERT GASES

In contrast to Halocarbon agents, Inert Gases are considered passive agents, in that they alter the atmosphere around the fire and do not directly interact with the fire itself. Inert Gases are used to lower the oxygen content within an enclosure typically to 10-14%, where oxygen concentration below 12-14% will not sustain combustion. A number of different Inert Gas blends, or pure mixes have been used in fire suppression, as shown in the table above. All of these inert gases are electrically non-conductive; they are stored as high-pressure gases and have discharge times in the order of sixty seconds. Due to the inability to store these inert gases as compressed liquids, significantly more storage space is required when compared to Halocarbon agents such as FM-200. Since oxygen levels are reduced, occupancy of the protected space post-discharge is typically restricted in comparison with Halocarbon extinguishants.

NOT IN-KIND ALTERNATIVES

Alternative technologies such as Water Mist and Pyrotechnic Aerosols are still yet to develop widespread acceptance in the replacement of land based halon systems. This is primarily due to the fact that much of the testing and approval of these systems is on an individual application-by-application basis. Thus a particular application (such as gas turbines or flammable liquid stores) must have been specifically tested by an approval agency and clearly defined design limits for that specific application approved.

Some end users have chosen to replace Halon 1301 systems with early warning smoke detection alone. This option may be valid if the response time to an alarm is short or if the area is always manned. For remote facilities or those that are not continuously manned, a suppression system in conjunction with an early warning smoke detection system is most often preferred.

FACTORS TO CONSIDER DURING RETROFIT

In assessing the various Halon alternatives available one of the many categories to consider is third party approval and listing. Third parties such as Factory Mutual Research Corporation (FMRC), Underwriters Laboratories (UL) and Loss Prevention Council Board (LPCB) thoroughly test the systems and agent to ensure compliance with local codes and standards and that the product is safe for its intended use. A third party approval gives the end user peace of mind that the system has met a recognized code or standard, and adds to the manufactures own recommendations. An approval is a clear way to distinguish between competing products when an end user is making a decision on suitable products.

A small number of Halon retrofit systems claim the ability to re-use existing pipe work. The re-use of existing Halon pipework can save the end user both significant downtime and cost. Before re-use however it should be determine that the type and grade of pipe is suitable for the new agent. Also the manufacturer or their representative should be able to demonstrate via hydraulic calculation that the in-situ pipework is sized correctly for the new agent and complies with the new systems installation requirements.

THE HALON RETROFIT SOLUTION

The Advanced Delivery System (ADS), which utilizes Great Lakes Chemical Corporation's FM-200 and is manufactured by Kidde-Fenwal, provides an all round solution to the problem of Halon retrofit. Using patented technology, the ADS system enables Halon retrofit with a minimum of business interruption to the end user. The ADS system utilizes a "piston-flow" design in which the nitrogen gas "pushes" the FM-200 liquid through the piping. Nitrogen and the FM-200 agent are stored in separate cylinders that are connected with a hose and control hardware. When the system is actuated, the nitrogen flows into the FM-200 cylinder, which opens the FM-200 valve so that the agent discharges through the system piping.

This unique design enables an increase in flow rate for the FM-200 agent and a sustained higher average cylinder pressure. This leads to smaller diameter pipe sizes (essential for retrofitting already installed Halon piping), while the relatively constant pressure allows for significantly longer pipe runs than conventional FM-200 systems. In fact, pipe distances of up to three times the normal pipe length for an FM-200 system can easily be achieved. What this means is that the ADS system can be an effective retrofit solution for Halon 1301 systems, with little or no modification to existing system piping. This means significant reduction of costs, downtime and inconvenience associated with the removal and replacement of Halon systems. The new ADS system also offers significant advantages for new fire protection applications and is fully UL listed and FM approved. The increased flow rates facilitate longer pipe runs, more complicated pipe layouts and networks, small diameter piping, and greater installation flexibility. The new system allows even more businesses to take advantage of the unsurpassed speed, safety, and space savings of an FM-200 fire suppression system.

CONCLUSION

The need for Halon alternatives, and in particular for systems able to retrofit installed Halon systems is growing. A number of countries around the world currently have phase-out and decommissioning dates in place for Halon 1301 systems. This trend is only likely to continue as time goes on. Careful consideration of the available options is required and a number of factors should be considered including product approvals and ability to re-use existing pipe arrangements. The ADS system combines the preferred Halon replacement agent FM-200 with patented technology to ensure that the end user experiences minimal business interruption and is provided with the most economical installation solution.

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New methods needed to eva water spray and water mist

By Magnus Arvidson and Tommy Hertzberg,
SP Swedish National Testing and
Research Institute

The tests were carried out in a 500 m^3 'engine compartment' enclosed by steel walls.

TIME UNTIL EXTINGUISHMENT is a poor measure of the efficacy of water spray or water mist systems. Recent fire testing shows that variations in the performance of the same system can be of the order of several tens of percent under apparently identical conditions. Better methods for evaluating the efficacy of total compartment water spray and mist fire protection systems during fire testing are therefore needed.

About two-thirds of all fires on board ships start in the machinery space. An estimation[1] made by Det Norske Veritas (DNV) indicates that the direct cost for a fire is of the order of 1 – 4 million USD for a cargo vessel – and much more for a passenger vessel. A fire in the machinery space also represents a hazard for the crew members and fire fighters and may lead to a situation where passengers need to be evacuated from the vessel.

Traditionally, Halon and Carbon Dioxide (CO_2) gas extinguishing systems are those most commonly used in machinery spaces. With the phase-out of Halon and increasing safety concerns regarding the use of CO_2, a need for alternative fire protection systems has emerged.

During mid-1990s the International Maritime Organisation (IMO) developed fire tests procedures,[2,3] MSC/Circ.668 and 728 for water based fire protection systems considered as 'equivalent' to Halon systems, for machinery spaces and pump rooms on board ships. Numerous tests according to these fire test procedures have been conducted, and currently a revision is proposed. The performance requirement of these fire test procedures is based on 'time to extinguishment'.

There are presently several certified system concepts on the market that all pass the current IMO fire test procedures. Some systems use extremely low amounts of water inside the compartment combined with massive water curtains in front of the doorway openings; while others use the approach of turning the system on and off in prescribed sequences, or alternating between high and low pressure. Yet other systems use inert gas or other additives to enhance the extinguishing performance. All concepts are optimised to reduce the time to extinguishment for a particular fire test scenario. Although the concepts mentioned all represent clever ways of passing the fire test, it is not necessarily the case that the concepts represent sound fire protection in practice.

Therefore, there is a need for efficient fire test procedures and quantifiable parameters that can be used to distinguish between acceptable or non-acceptable water spray or water mist system concepts for machinery spaces. It is also necessary to define parameters that capture the true characteristics of a given system, so that its potential to function in a variety of environments (enclosure volumes, ventilation conditions, fire sizes, etc) is secured.

Experiments

A first series of experiments at the Swedish National Testing and Research Institute (SP) has been carried out in an engine compartment with a volume of 500 m^3. The compartment measured 8,0 m by 12,5 m and had a ceiling height of 5,0 m. The walls and the ceiling were constructed from nominally 2 mm thick steel plates. The compartment was fitted with one doorway opening at floor level and three positive pressure relief vents, with steel hatches at the ceiling. The doorway opening had a large sliding steel door, which was open during the ignition of the tests fires, but was closed immediately thereafter.

The test compartment was instrumented to measure thermal conditions inside the test compartment, including the wall and ceiling temperatures, and radiant heat flux from the fires. Further, the compartment pressure, the humidity and the gas concentration of O_2, CO and CO_2 were measured.

Three different systems were used in the tests:

1. A water spray system flowing 500 L/min at 2 bar. This system was designed according to the SOLAS convention. Eight pendent nozzles were installed at the ceiling using a 3,33 m by 3,33 m spacing. The nozzles were made by Tyco Fire Products and designated Protectospray D3 25-110. The nozzles had a K-factor of 43,2 (metric) and a spray angle of 110°.
2. A low-pressure system flowing 97 L/min at 12 bar. Eight upright nozzles were installed at the ceiling using a 3,33 m by 3,33 m spacing. The nozzles were manufactured by Tyco Fire Products and designated *AquaMist* AM15. The nozzles had a K-factor of 3,6 (metric).
3. A high-pressure system flowing 60 L/min at 70 bar. Four pendent nozzles were installed at the ceiling using a 2,5 m by 5,0 m spacing. The nozzles were manufactured by Marioff Corporation Oy and designated Hi-Fog 4S 1MC 8MB 1000. The nozzles had a K-factor of 1,9 (metric).

The trials involved various sizes of pool fires and different degrees of ventilation. The fires had nominal heat release rates of 500 kW, 1 MW and 2 MW, respectively and were either fully exposed to the water spray or completely shielded by a horizontal obstruction steel plate.

luate the performance of systems during fire testing

Several interesting results

The extinguishing times varied between three minutes for large exposed fires, up to 30 minutes for small obstructed fires. Although the fact that small obstructed fires take the longest time to extinguish is well known, some of the results were a surprise. It was, for example, unexpected that the extinguishing time for the smallest fires (500 kW) was least under free-burning conditions (i.e. without using any system!). The extinguishing times for the two larger pool fires (1 MW and 2 MW) was comparable with and without any system present. However, it should be pointed out in this context that the time to extinguishment is a very poor measure, as discussed in more detail below. Nevertheless, the results show that the advantages of a water spray or a water mist system do not necessarily lie in a shorter extinguishing time. If an engine room is sufficiently airtight and robust, the fire will self-extinguish just as quickly, or more quickly, than would be the case with a water spray or a water mist system involved.

Generally, the water spray system provided significantly better gas phase cooling than both the low-pressure and the high-pressure water mist systems for the obstructed 500 kW and 1 MW fires. This is primarily attributed to the higher water flow rate of the water spray system. It is also noticeable that the gradual decrease in temperature is more significant for the water spray system tests compared to the other two systems. For the 2 MW fires, the difference in gas phase cooling for the three systems is not as great, although it is clear that the water spray system provides the fastest cooling. The gas phase cooling capability of the three systems is further discussed below.

The water spray system also provides the best wall surface cooling of the three systems tested. The wall cooling ability of the low-pressure and the high-pressure water mist systems are essentially comparable.

In general, there is a negative pressure when the water spray or water mist system is activated and cooling starts, followed by a positive pressure as the water begins to vaporise. As the test compartment incorporated pressure relief valves in the ceiling, positive pressure was not a problem. However, the negative pressures were surprisingly large, in the order of 400 Pa. This effect has not previously been discussed in connection with fire protection systems of this type. The trials also showed that a substantial negative pressure (in the order of 300 Pa to 500 Pa) could be generated just as the fire is put out, due to the sudden drop in temperature that occurs then.

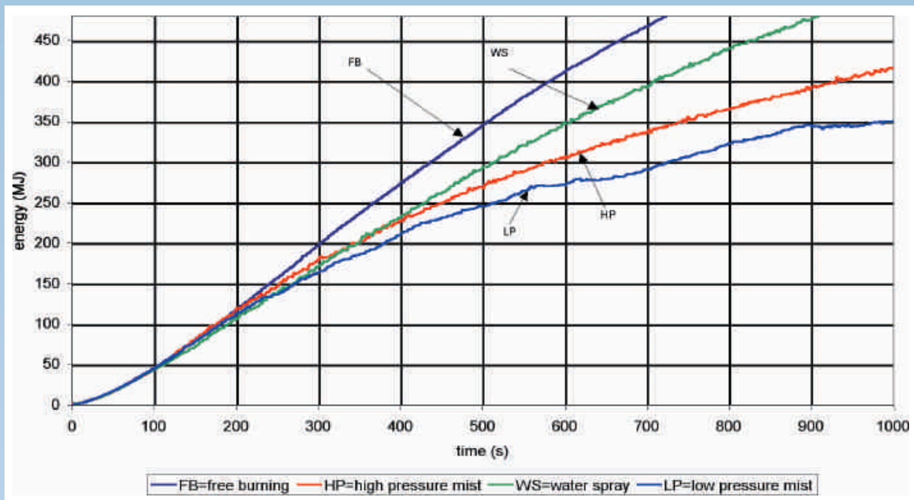

Figure 1. The Total Heat Release Rate (THR), based on the weight loss of the fire tray, for the obstructed 500 kW heptane pool fire scenario. This figure illustrates the 'inerting' effect of the three tested systems.

The results show, in other words, that engine rooms protected by water spray or water mist systems should be fitted with both negative and positive pressure relief vents.

For exposed pool fires, it is clear that an 'efficient' fuel surface cooling can counteract extinguishment. When water droplets are large enough to penetrate the fire plume and the flame of the fire, i.e. to interact with the fuel surface, the extinguishment of exposed fires may be prolonged compared to obstructed fires of the same fire size. This effect was primarily observed for the water spray system, but to some extent also with the low-pressure system. When the water droplets are small enough to interact with the flame of the fire, exposed fires are generally extinguished faster than obstructed fires. This was observed with the high-pressure system. This experience supports the conclusion that 'time to extinguishment' is an inadequate measure of the performance.

The tests indicate that the high-pressure system provided slightly better mixing of water droplets, water vapour and combustion products within the compartment, compared to the water spray system and the low-pressure system. However, for 2 MW fires the high turbulence inside the compartment, resulted in all three systems providing similar mixing efficiency. Indeed, the free burn test is comparable to those conducted using the three systems, which illustrates the effect of turbulence generated by the fire

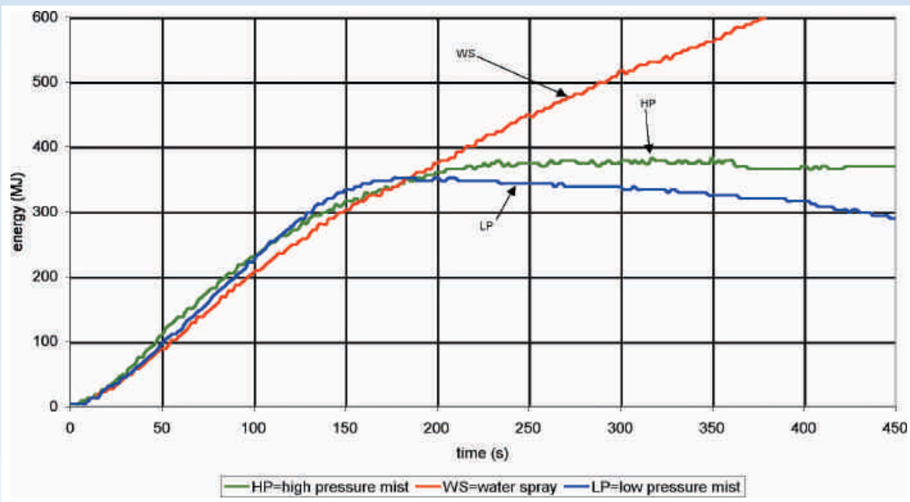

Figure 2. The Total Heat Release Rate (THR), based on the weight loss of the fire tray, for the obstructed 2 MW heptane pool fire scenario. No free burn data available.

New methods needed to evaluate the performance of water spray and water mist systems during fire testing

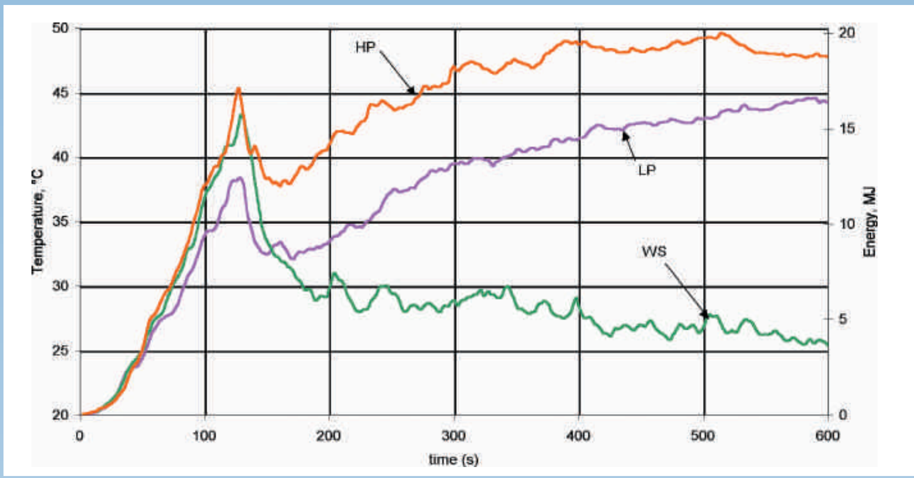

Figure 3. The average gas temperature inside the tests compartment and the energy accumulated in the gas, for the obstructed 500 kW heptane pool fire scenario.

itself on providing good mixing. The mixing ability for the low-pressure system was not influenced by the fact that a large hatch at the ceiling was fully open, as compared to the cases where the test compartment was sealed closed. The ability of the water spray system and the high-pressure system to provide proper mixing was reduced. The measurements of the concentration of Carbon Dioxide (CO_2) were used for the evaluation of the mixing ability. A ratio indicating the mixing ability was obtained by dividing the measured concentration at the highest position with the measured concentration at the lowest position.

Time to extinguishment is a poor measure of the performance

The present practice of evaluating the efficacy of total compartment water spray or mist systems during fire testing is to measure the time taken to extinguish the fire. However, the trials presented here have shown that this is a very poor measure. When some of the trials were repeated using the same system and under apparently identical conditions, the extinguishing time could vary by up to as much as 80 %. The reason for this is that fires are highly non-linear phenomena, in which small variations in the initial conditions or boundary values (wall temperatures, air tightness of the compartment, etc.) can result in major changes in the rate at which the fire develops or in its final state. In addition, the fact that the interaction between the water droplets and the fire is also highly complex, and that relatively minor temperature variations can result in major differences in both the rate of evaporation and the rate of combustion are important.

It seems clear that the performance have been based on a highly dubious criterion: 'time to extinguishment'. In addition, the choice of fire scenario has a major impact on the extinguishment time, i.e. on the estimated quality of the system, by today's standard test methods. There is a definite risk that a system is optimised in order to provide good test performance when dealing with a particular fire scenario, rather than being developed to operate well under most conditions.

A new approach of evaluating the efficacy of systems

The problem lies in knowing which characteristic measures truly indicate whether the performance of a water spray or water mist system is acceptable or not. Based on the

trials at SP, the following three characteristics quantifiers are proposed:

- the systems capability for inerting a compartment
- the systems capability for gas phase cooling of the compartment
- the systems capability to mix the atmosphere within a compartment

These points are discussed further below.

1 Inerting. The inerting effect of water is related to its vaporisation. Water vapour dilutes the gas phase environment and reduces the accessibility of available oxygen, which in turn reduces the rate of combustion of the fire. In this context, the capability of the droplets to be transported into the flame zone is also important. The phase transformation introduces a ~1700 times volume expansion, which has a major impact on the flames. A water mist system that uses small droplets and achieves a high degree of mixing will create efficient inerting conditions, even for obstructed fires.

One method to measure this capability is to compare the amount of produced energy from a given pool fire with and without the water spray or water mist system. A load cell positioned under the pool fire tray will show the variations of momentary effect, which when integrated over time will give the total energy produced (Total Heat Release, THR). By using an obstructed pool fire, the impact from droplets impinging on the fuel surface will be minimized.

Figure 1 illustrates the THR for the obstructed 500 kW heptane fire scenario.

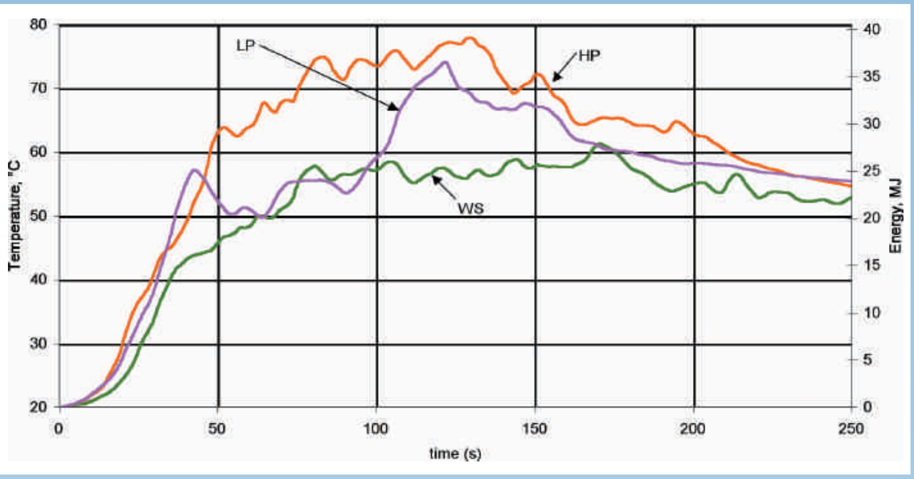

Figure 4. The average gas temperature inside the tests compartment and the energy accumulated in the gas, for the obstructed 2 MW heptane pool fire scenario.

It can be seen that the water spray system, 10 minutes after its activation (i.e. at t=720 s as the pre-burn time was 120 s) has reduced the THR by 16% compared to the free burning scenario. The high-pressure water mist system has lowered the THR by almost twice as much, 29% and the low-pressure mist system has decreased the amount even more, by approximately 38%. Figure 2 illustrates the THR for the obstructed 2 MW fire scenario (no free burn data was available for this case). The trend is similar for this fire scenario, i.e., the water spray system provides the least reduction of the THR and the low-pressure system the highest reduction.

It should be noted that the fire itself usually provides an important inerting effect through the formation of Carbon Dioxide and water vapour in the combustion reactions.

2 Gas phase cooling. The capability of rapid cooling of hot fire gases is important, e.g. to prevent the fire from spreading to other spaces and to allow for fire fighters to approach the area. Rapid cooling is relatively easy to obtain with a high volume flow rate of water. However, for many applications, reduced amounts of water are called for and the cooling capability might be a crucial issue. Technically, gas phase cooling can be determined by measuring the gas temperature at sufficiently many spots in a fire test compartment, in order to obtain a valid mean

New methods needed to evaluate the performance of water spray and water mist systems during fire testing

temperature value. This value corresponds to the accumulated energy of the gas volume and by comparing the results obtained for the tested system with free burn data, the cooling capability can be quantified. The energy losses through the boundaries of the test compartment vary depending on the gas/wall temperature as well as possible liquid film on the enclosure surfaces. However, the lack of an absolute measure is not important since the obtained value can be compared to the results from other tested systems, i.e. it can be used as a relative measure. Figure 3 and 4, shows the average gas temperature inside the test compartment for the obstructed 500 kW and 2 MW heptane fires, respectively. The water spray system provided the best cooling for both cases. The figures also show the energy accumulated in the gas. This value is calculated by assuming a constant heat capacity of the gas volume (1350 J/m^3).

The systems combined capability for gas phase cooling and inerting of a compartment (i.e. the net effect from these two characteristics) can be calculated. This is illustrated in figure 5. The result is obtained from the difference between the THR for the free burning scenario and the accumulated energy value, as shown in figures 3 and 4. The figure, which illustrates the obstructed 500 kW heptane fire, shows that all three systems perform very similarly, with the water spray system being slightly 'better' than the other two systems.

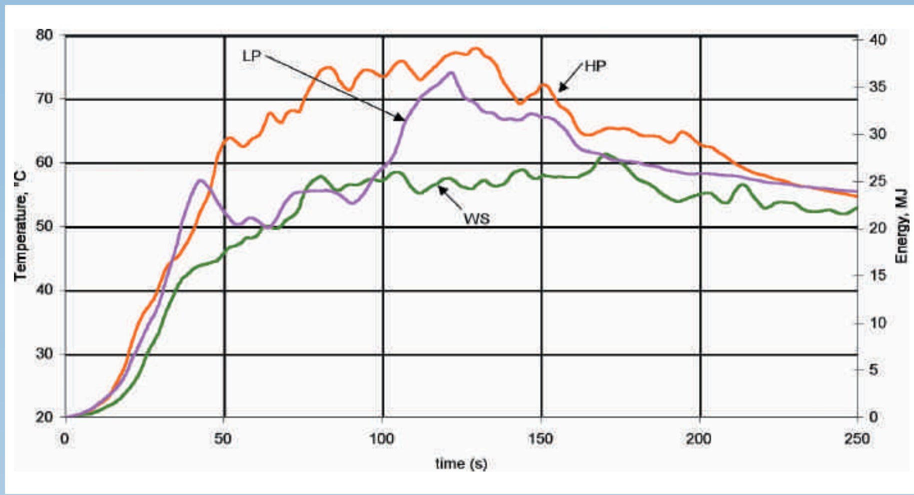

Figure 5. The combined gas phase cooling and inerting effect (i.e. the difference between the THR for the free burning scenario and the accumulated energy value) for the three systems. The figure illustrates the obstructed 500 kW heptane pool fire scenario.

3 Mixing. The ability to mix water droplets, water vapour and combustion products within a compartment expresses a characteristic quality of a water spray or a water mist system. Mixing is a measure of how the initial momentum of the water droplets is transferred to the gas. A high degree of mixing may be obtained using a high system flow rate. Systems with higher flow rates typically have higher momentum sprays from the nozzles that result in better mixing due to the increased turbulence in the compartment. A high degree of mixing may also be obtained using large droplets, however, larger droplets provide less water/gas interface area per volume of water, compared to smaller droplets. This in turn means that the gas phase cooling will be less efficient. In addition, large droplets are less prone to interact with 'obstructed' fires, i.e. fires that cannot be directly 'hit' by droplets from the water spray. The mixing capability might be considered as a measure of how well the system will function in fire scenarios different from the scenarios used in the fire test procedure. Such a test should be performed without any fire source, in order to avoid the additional mixing induced by the actual fire. The mixing capability can be measured, e.g. by introducing an inert gas substance (such as Carbon Dioxide) into the test compartment and registering the time it takes for the water spray or water mist system to 'stir' the volume so that an even concentration is obtained throughout the compartment.

Additional work is needed

These three proposed quantifiers are not independent of each other, but cover different aspects of the performance of a given system and provide a good picture of the characteristics and efficacy of water spray and water mist systems during fire testing. Much experimental work is still needed in order to make a definitive statement on which requirements should be imposed in any approvable system for use in ship engine rooms. The advantage of these suggested quantifiers is that they have a considerably better potential for experimental repeatability and reproducibility, and that they provide a more realistic representation of the performance of total compartment water spray or a water mist systems than present-day test methods. The advantage of the existing parameter 'time to extinguishment' is obviously its simplicity once a time limit for the extinguishment has been established. However, the simplicity also has the disadvantage of carrying very little practical system information to the end user. As has been discussed in this article, the parameter is also very uncertain and sometimes even nonsensical with regard to the system extinguishing qualities.

Vinnova, the Swedish Agency for Innovation Systems, finances the project described in the article. Two companies are involved in the project: Marioff Hi-Fog Oy (Finland) and Tyco Fire Products (USA).

References

[1]"Engine room fires can be avoided", information from Det Norske Veritas, 2000/05/01.

[2]"Alternative arrangements for halon fire-extinguishing systems in machinery spaces and pump-rooms", MSC/Circ. 668, 30 December, 1994 – Appendix B, "Interim test method for fire testing equivalent water-based fire-extinguishing systems for machinery spaces of Category A and cargo pump-rooms", International Maritime Organization, London, UK.

[3]"Revised test method for equivalent water-based fire-extinguishing systems for machinery spaces of Category A and cargo pump-rooms contained in MSC/Circ.668", 4 June, 1996, International Maritime Organization, London, UK.

[4]FP47/8, "Performance Testing and Approval Standards for Fire Safety Systems, Report of the Correspondence Group", document submitted by the United States to the 47th IMO session on Sub-Committee on Fire Protection to be held February 10–14, 2003, document dated 7 November 2002.

Magnus Arvidson is a graduate Fire Protection Engineer from the University of Lund in Sweden. He has been involved in the development of installation guidelines for water mist systems for shipboard use at the International Maritime Organisation and has served as a member for the NFPA 750 technical committee from 1993 to 2000. Currently he is involved in the development of a CEN standard for water mist systems and a member of the research council of the International Water Mist Association. He can be reached at telephone +46 33 16 56 90 or magnus.arvidson@sp.se.

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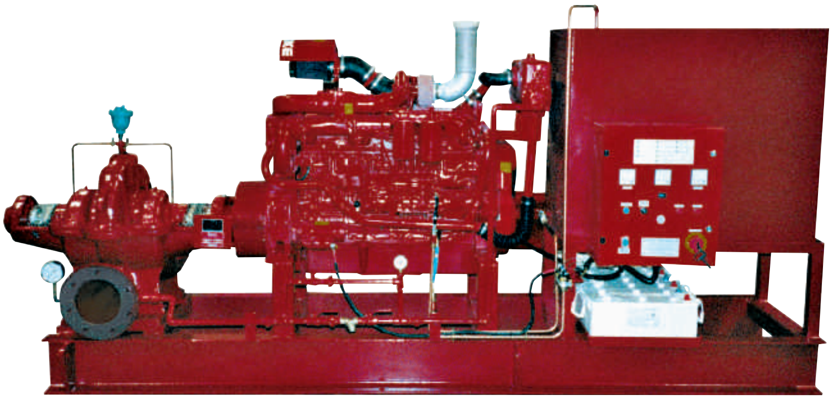


PATTERSON FIRE PUMPS ...Sentinels of Safety

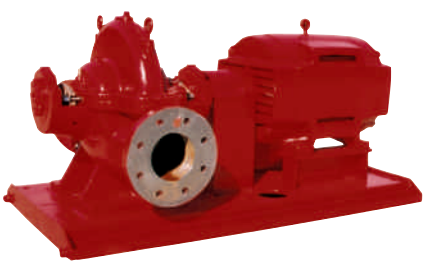
Patterson fire pumps are used in a variety of services – standard high pressure pumping, low-pressure booster pumping and special fire service pumping. They are especially designed to fit the requirements of automatic sprinkler systems, fire hydrants, standpipes, deluge systems, fog systems or any other element of fire protection service.

Patterson continues to be the industry leader in prompt delivery of fire pumps worldwide, providing horizontal split case, high pressure two stage, end suction, vertical-in-line, vertical turbine and prepackaged Pre-Pac® pumps, with electrical motors, diesel engines or dual drive combinations. Its fire protection pumps were shipped to over 60 countries in 2002.

A wholly-owned subsidiary of Patterson Pump Company U.S.A., Patterson Pump Ireland Ltd. is ISO 9000 certified, attesting to its world-class quality and dependability.

This independent European manufacturer is headquartered in Mullingar, County Westmeath, Ireland, where it builds, fabricates, assembles and tests all types of Patterson fire pumps. Sales and customer service representatives are also located there. A sales office in the UK has representatives throughout the continent, including Eastern Europe.

Patterson Pump Ireland services its customers from sales to order entry, to manufacturing and testing, to shipping and on site commissioning. A complete range of pumps is manufactured at the Mullingar facility. In addition, Patterson Pump Ireland can convert a container into a fully operational pump house. Industry standard fire pumps are UL and FM listed; LPCB, VdS, and CNBOP approved; and meet all requirements set forth by NFPA and the European Local Rules Market countries.



Horizontal Split Case Fire Pumps

Precision balancing of all factors in the design of Patterson Horizontal Split Case Fire Pumps provides mechanical dependability, efficient operation and minimal maintenance. Simplicity of design ensures long, efficient unit life, reduced maintenance costs and minimum power consumption. They operate with pressures in excess of 390 psi (27 bar) and up to 5,000 GPM (18,925 L/M).

High Pressure Two-Stage Fire Pumps

High Pressure Two-Stage Fire Pumps are engineered to produce as much head as two single-stage pumps in series, and are much more compact in size. Heavily built, they are highly efficient and have every mechanical feature to assure long and reliable service.

Designed in sizes from 3″ (75 mm) to 6″ (150 mm) discharge, for capacities to 1,000 GPM (3,785 L/M), and for heads to 1,150 feet (34 bar), they represent the most economical pumping equipment available for rugged and reliable service.

Vertical In-line and End Suction Series Fire Pumps

Patterson's V.I.P. In-line and End Suction Fire Pumps are designed for ease in adapting to existing systems or being designed into new systems in safety applications. Their ease of installation into pipe lines eliminates the need for costly foundations or pads. Standard piping supports on either side of the pump are all that is required. Vertical In-line suction and discharge flanges are on a common center line, 180° apart, for mounting in the pipe line. End Suction Pumps have center line suction and discharge.

Both pump types feature full ranges of psi (bar) and GPM (L/M).

The Patterson Pre-Pac® Fire Pump

The Patterson Pre-Pac Fire Pump was created to provide quality fire control at less cost and in less space. Unlike conventional pumping systems, the Pre-Pac is self-contained so it saves money by reducing labor, engineering and installation time.

The real muscle of this prepackaged system is Patterson's reliable split case or vertical turbine pump, featuring discharge pressures of 40 to 390 psi (2.8 to 27 bar) and capacities of 150 to 5,000 GPM (565 to 18,925 L/M), plus all the necessary ranges of hydraulic performance that meet individual requirements and European standards.

Whether you select a completely housed Pre-Pac or a base mounted package, you can be assured that all sensing lines, fittings, piping, drive, pump and controls are designed to meet, or exceed, all applicable codes. For an added measure of security, the Pre-Pac is completely unit tested with all piping hydrostatically tested.

Patterson Vertical Turbine Fire Pumps

Patterson Vertical Turbine Fire Pumps employ the latest design concepts and engineering technology in producing highly efficient pumps for use in all safety applications. They can be staged as necessary to meet desired requirements. Minimum floor space is required. Fire fighting application capacities are from 500 to 5,000 GPM (1,892 to 18,925 L/M), with pressures up to 350 psi (24 bar).

A Final Word

World-class quality fire pumps, lower maintenance costs, less downtime, and prompt delivery of O.E.M. parts which are guaranteed to last longer typify Patterson as one of the world's most reliable fire pump manufacturers.

For more information, contact:

Patterson Pump Ireland Ltd.

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Mullingar, Co. Westmeath, Ireland
Tel: 353 44 47078
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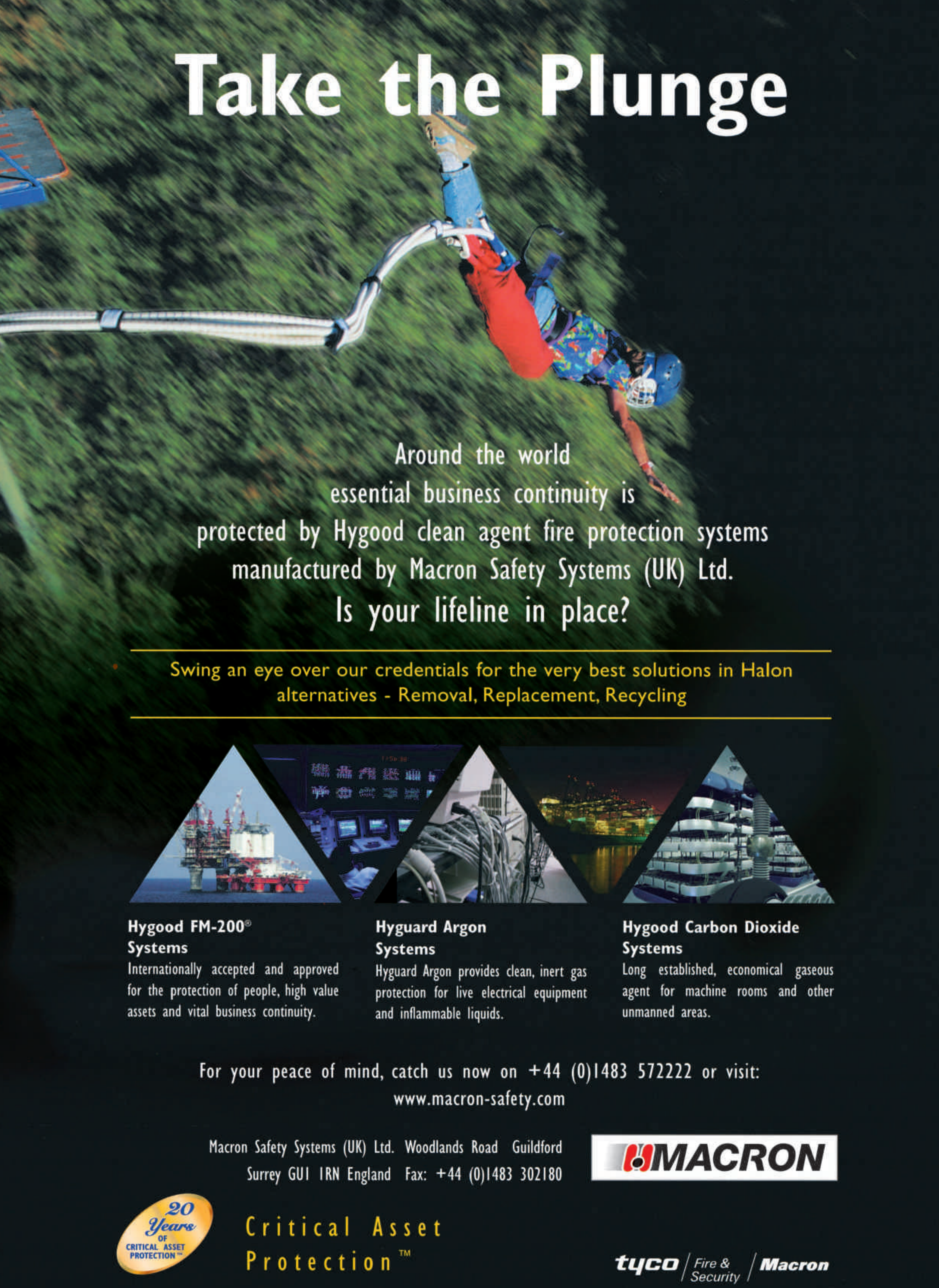
Web: www.ie.pattersonpumps.com
E-mail: rpelot@pattersonpumps.com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Now
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THE K- 22-MAGNUM
ESFR SPRINKLER

DESIGN SAVINGS:

- SPRINKLER HAS BEEN OPTIMIZED FOR 45 FEET HIGH BUILDINGS.
- MINIMUM SYSTEM DESIGN SAVINGS IS:
  - 216+ GPM FOR cULUS
  - 240+ GPM FOR FM APPROVAL

BELOW THE K-25!

SINGLE SPRINKLER PRESSURE & FLOW REQUIREMENTS:

Approval	Bldg. Height	K-25		K-22		K-22 System Savings
		PSI	Flow	PSI	Flow	
cULus	45' w/ 40' Stor.	40	160	40	142	216+ GPM
FM	45' w/ 40' Stor.	50	178	50	158	240+ GPM

- ELIMINATE IN-RACK SPRINKLERS FOR 45' HIGH BUILDINGS.
- LOWER FLOWS OFFER OPPORTUNITIES TO REDUCE:
  - INTERIOR PIPING
  - UNDERGROUND PIPE
  - FIRE PUMPS SIZES
  - TANK SIZES
- MAXIMUM DEFLECTOR DISTANCE FROM CEILING (ROOF) = 18 INCHES.
- AVAILABLE IN 155°F AND 200°F

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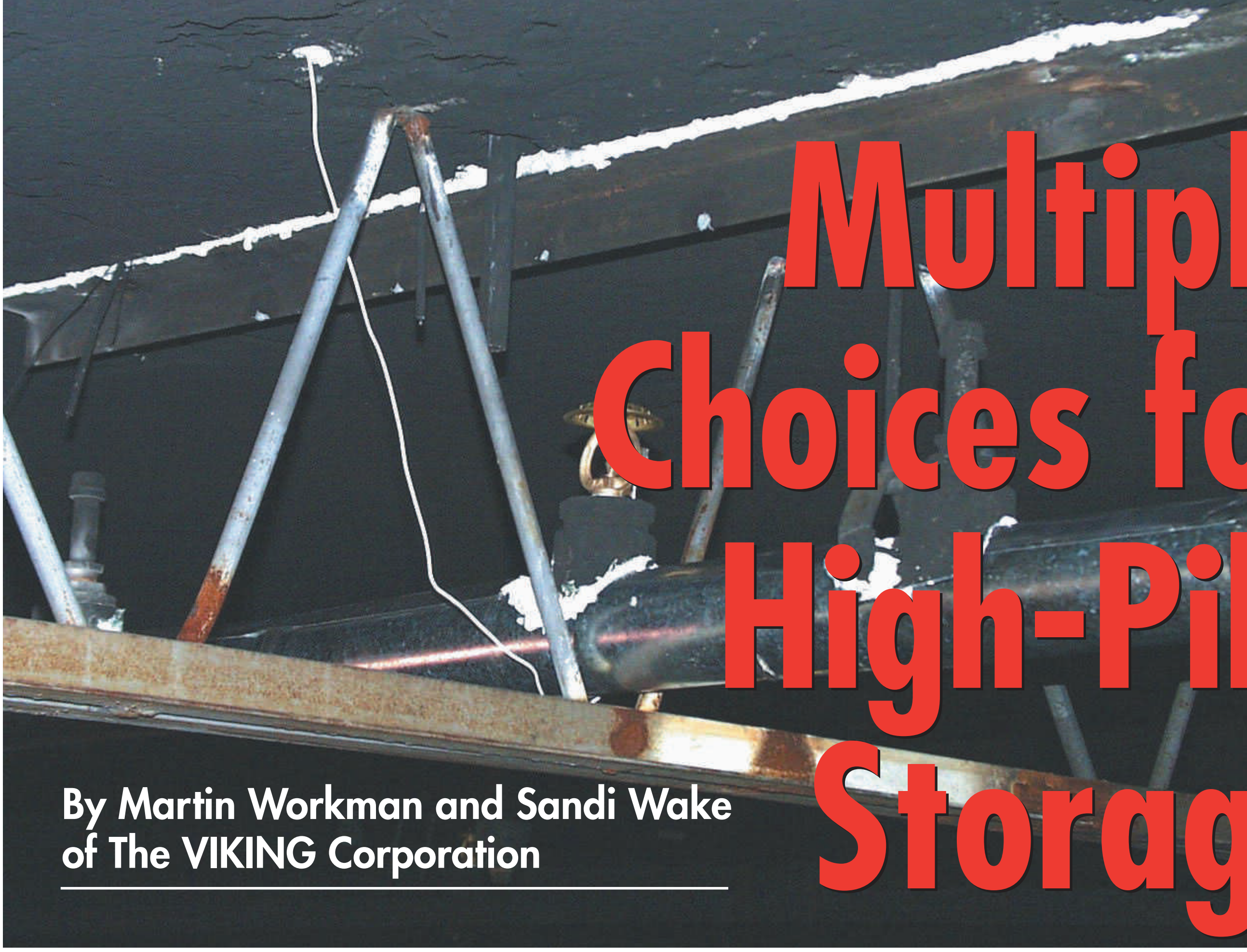
Multiple Choices for High-Pile Storage



By Martin Workman and Sandi Wake of The VIKING Corporation

This obstructed 14.0 K Upright ESFR sprinkler successfully passed FM fire tests.

SPRINKLERS FOR STORAGE APPLICATIONS have probably been used since the late 1800's when the first Parmalee sprinklers were installed in his piano factory. It is reasonable to assume that these sprinklers were used to protect the stored raw materials used to make the pianos as well as any machinery and the building itself. Since that time, research and development has increased with the goal of providing better fire protection at a lower cost to encourage growth in the industry. Over the last 15 years, several industry groups have focused on specific problems, resulting in new sprinklers and technologies. One of the most significant changes has been in sprinklers designed especially for storage applications.

EVOLUTION OF STORAGE SPRINKLERS

Storage sprinklers can be divided into two distinct groups: those used for storage applications up to 12 feet and those used for storage applications over 12 feet, or high-pile storage. High-pile storage is the topic of this article.

The original standards for high-pile storage were found in NFPA 231 (these have since been moved to NFPA 13), and were established based on fire testing that utilized only ½″ (15 mm) and ¾″ (20 mm) spray sprinklers, with K factors of 5.6 and 8.0 respectively. Consequently, these were the only sprinklers allowed, and high pressures were common. Larger orifice sizes were introduced to reduce starting pressure for the higher water delivery requirements, or densities. And in the 1980s, new challenges, due to the high storage heights and the increased flammability of products being stored, prompted an increase in the development of new types of sprinklers. Plastic commodities and storage heights over 30 feet, with application densities of .4 to .6 gallons per minute per square foot or higher have become commonplace, while they used to represent the exception.

To address the changes in storage, Large Drop technology was initially developed. These sprinklers utilize high pressure and larger droplets of water to penetrate the fire plume seen in "high challenge" high-pile storage fires. They are allowed in storage applications up to 20 feet in wet and dry systems, without the need for in-rack sprinklers.

ESFR SPRINKLERS OFFER DESIGN ADVANTAGES

The next new development was Early Suppression, Fast Response (ESFR) technology, pioneered by Factory Mutual Research and Engineering – the long-time champion of research and development of storage sprinklers. ESFR sprinklers use a combination of higher pressures and fire suppression to eliminate in-rack sprinklers, and can be used where storage is up to 35 feet high.

The ability of ESFR sprinklers to virtually eliminate the use of in-rack sprinklers for the protection of class A combustible materials stored in racks, has been a great advantage to building owners and storage facility occupants. A lower cost installation and added flexibility for the occupant has made conventional systems with in-rack sprinklers "old technology."

Sprinkler contractors and designers also see advantages when using ESFR's. The competitive water usage and relative ease of design for an ESFR sprinkler system is very attractive. Storage sprinkler system design was at one time considered an "art" by many. This is due to the complexity of determining the correct design due to the many credits, and design area and density increases required by both NFPA 231 and 231C, based upon the type of storage, the storage height, temperature of the sprinkler head, and the distance between the top of storage and the ceiling where the sprinklers were installed. The application of ESFR sprinklers has eliminated this complexity.

Upright ESFR testing at FM for 30-foot storage at 39.2 seconds and 51.25 seconds into the test.

LIMITATIONS TO ESFR PENDENT TECHNOLOGY

The first ESFR sprinklers introduced were pendent style. And while ESFR pendent technology offers many advantages, as with all sprinklers there are strict guidelines for its usage. Factory Mutual created the guidelines and limitations regarding how and where ESFR sprinkler systems may be installed. These include:

- Low tolerance of obstructions below or to the side of ESFR sprinklers
- Specific pressure requirements for given K factors correlating to ceiling heights
- Installation on wet systems only*
- Maximum 45-foot ceiling height without the installation of in-rack sprinklers, is specific to 25 K factor ESFR's only

Factory Mutual recently changed their approvals on pendent ESFR's with K factors of both 14 and 17. They no longer allow the use of these sprinklers in rack storage in buildings with 45-foot ceilings without the use of in-rack sprinklers.

ESFR sprinklers are "suppression mode" sprinklers. This means that rather than controlling the fire by cooling the atmosphere and wetting the adjacent areas, an ESFR sprinkler is designed to suppress or extinguish the fire. For ESFR sprinklers to effectively suppress a fire, it is imperative that they operate in the early stages of the fire and deliver large amounts of water through the fire plume directly onto the fire. If the amount of water needed is not delivered soon enough, suppression – *or even control* – may not happen. Because the delivery of water onto the fire during its early stages is so important, quick operation of the first few sprinklers located *directly above* the fire is critical. Most fire-test failures of ESFR sprinklers are due to premature operation of sprinklers away from the fire area. This cools the surrounding atmosphere, temporarily delaying operation of the sprinklers directly over the fire.

With the initial ESFR sprinkler offering available only in a pendent orientation, there are additional considerations. The primary function of these sprinklers is protecting high-pile storage and pendent sprinklers are much more likely to be struck by a lift truck or encounter other mechanical damage. And, as in the case of all pendent type sprinklers, pendent ESFR's supplied from a raw water source must be installed on a return bend to eliminate the accumulation of sediment in the sprinkler.

ADVANTAGES OF AN UPRIGHT ESFR

Today, upright ESFR sprinklers are available to protect many of the same hazards as pendent ESFRs, while addressing some of the limitations. They are approved for storage heights up to 30 feet and building heights up to 35 feet, depending on the commodity being protected.

Because upright ESFR sprinklers are installed on top of sprinkler branch lines up to 3″ (80mm), they are designed to perform even when running through bar joists or trusses. In fact, they are approved for installation above continuous, ungrouped obstructions up to 4″ (100 mm) wide. Even obstructions such as small pipes, conduits or cross-bracing members can create problems for pendent ESFR sprinklers, by scattering water droplets and cooling the surrounding sprinklers, inhibiting their activation. This can cause sprinklers outside of the immediate fire area to operate, which is ineffective at putting the fire out and wastes valuable water resources.

It is estimated that over 95% of existing ESFR installations utilize pendent sprinklers with a K factor of 14. Many of these installations have been obstructed post-installation. This creates a dangerous situation as noted above. If these obstructions cannot be moved to comply with NFPA design criteria, the most cost-effective solution is to replace the K-14 pendent ESFR sprinklers with a K-14 upright ESFR.

Sprinklers installed on top of sprinkler piping are much less susceptible to mechanical damage than pendent sprinklers. The positioning of an upright ESFR minimizes the possibility of being struck by a lift truck. It also eliminates the cost associated with installing return bends when using a raw water source.

Another advantage of upright ESFR sprinklers is the additional vertical space below the ceiling available for branch line installation. Fusible elements of upright ESFR sprinklers must be located between 4″ (100 mm) and 13″ (330 mm) below the ceiling. It is much easier to keep the fusible element inside that heat zone using an upright ESFR installed on top of the branch line than it is with a pendent ESFR installed on the bottom of the branch line.

New technologies in sprinklers offer added protection in high-pile storage applications for Classes I through IV Hazards

CONCLUSION

New technologies in sprinklers offer added protection in high-pile storage applications for Classes I through IV Hazards. Multiple choices in K factors (14 through 25) and orientation allow you to choose the best product for your application to limit starting pressure, minimize pipe size and eliminate in-rack sprinklers and fire pumps, depending on the storage and building height. *The choice is yours!*

**All ESFR sprinklers are limited to use on wet systems. Large drop sprinklers may be used in dry systems (commonly freezer applications), typically without the need for in-rack sprinklers.*

This article is a collaborative effort between Martin Workman, Product Manager – Special Hazards and Sandi Wake, Marketing Manager of The Viking Corporation. Martin Workman has been in the fire sprinkler industry for 18 years. Before joining Viking in 1997, he worked as a sprinkler fitter, designer and estimator. Sandi Wake began her career at Viking in 1983 and has held various positions in customer service and marketing, including that of Product Manager.

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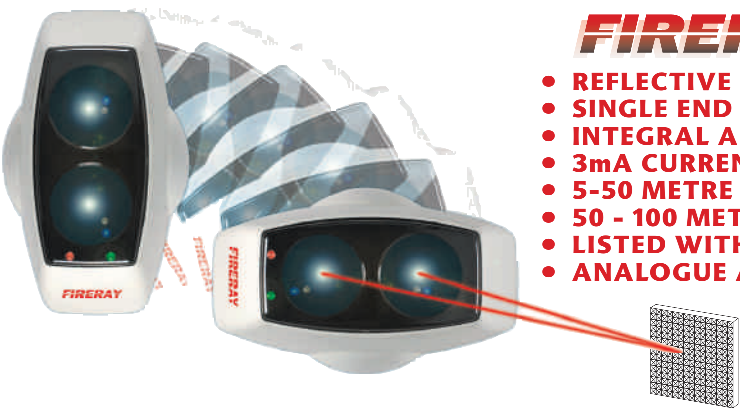

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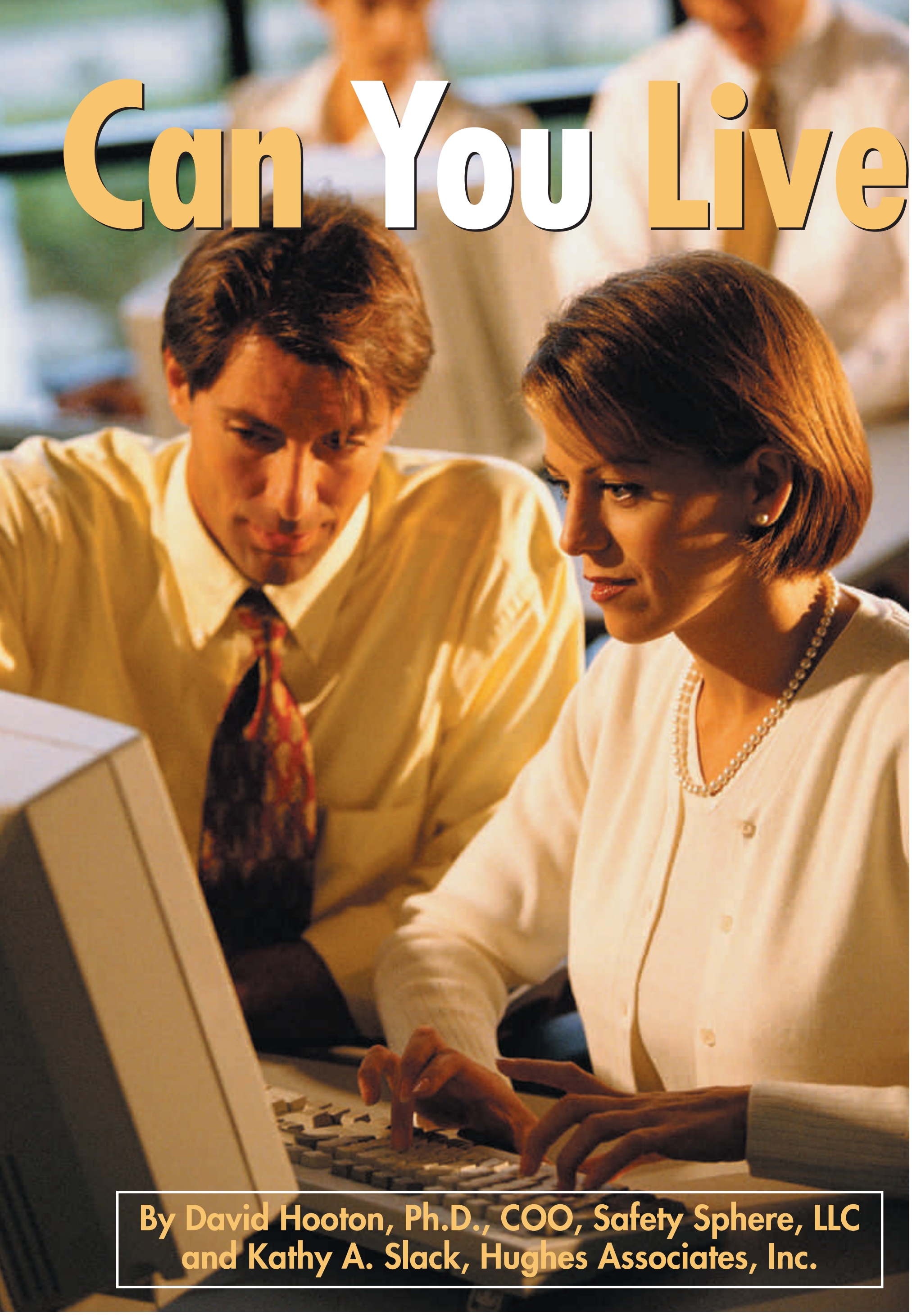

Pic courtesy of Hughes Associates, Inc.

MANY ORGANIZATIONS run mandatory employee training programs for a variety of job functions. Professionals view sales training as one of the more popular and important areas that, if run effectively, can make a major positive impact on the bottom line.

However, there may be other potentially problematic areas where employee training is critical to maintaining business operations.

How do you rate the effectiveness of your risk reduction training? Does this training ensure your employees can perform according to plan in the event of an unexpected event? As sure as the sun rises, you will face daily situations that require a precise response by others. Some of those responding may be located at your corporate site or in satellite operations. In order to assure management that you have created an adequate Fire Protection and Life Safety Master Plan, you need to ask yourself whether you can live with the results of your training program. Will your Plan serve to limit large scale risk reduction *after* an incident has occurred that tests the efficiency of both the Plan and employee training?

As a fire protection manager, you have developed a well-organized Master Plan that includes many components. One fundamental element deals with the selection of integrated automatic suppression and detection equipment. No doubt your Plan requires the use of equipment listed or approved by a testing agency. Your Plan most likely requires competent and reputable contractors to install this equipment. You can use a fire protection-engineering firm to help you select equipment and design systems to ensure that you facility has the proper protection when a fire occurs.

Another element of your Plan defines areas of risk and the policies and procedures your employees must follow. You may have obtained these definitions from your insurance broker or insurance carrier. You may have also sought the counsel of your local fire department, especially when special hazards are involved. But, are you confident that your employees understand your procedures and plans? Have you devoted the same effort to train personnel responsible for the maintenance of your systems that you have devoted to the training of sales personnel? What about the training of all other employees that may be impacted by a catastrophic event? If you do not run a mandatory program for employee training in this area, you may have a false sense of security that only an unexpected event will expose.

Whether your organization is a financial institution or a manufacturer of pharmaceutical substances, the way you follow through on your Plan depends on the employees' reactions and their level of understanding of what to do to maximize the safety at your facility.

PARADIGM CHANGES IN TRAINING...

Organizations have depended on training over a long period of time. Most of the time, the traditional classroom has served as the setting for training. Employees meet with an instructor, usually either annually or semi-annually to review new products, procedures and policies. Sometimes organizations

he Results of Your ee Training?

provide training to enhance corporate capabilities. Most organizations have found that "forewarned is forearmed". For decades organizations constructed such programs to feed new information to their workforce.

As a side effect to classroom training, employees often enjoyed the perks of travel to off-site facilities, as well as the opportunity to interact with associates and peers. Many times, employees would spend an 8-hour day in the classroom. After two days, many employees started "tuning out" as their levels of interest waned and their abilities to retain information became diluted. Instructors would quiz students in non-standard ways. Some instructors quizzed their students on an individual basis. Others randomly tossed out quiz questions to the group, a rather incomplete means of evaluating student comprehension.

As regular training programs grew in importance, many organizations developed weeklong training sessions off-site, as part of the cost of doing business. And, these sessions did prove costly. Not only did the training program have development and instructional costs, most programs required significant travel funds and expended large sums to pay for the almost incalculable cost of lost productivity or lost business opportunities.

Even with this expenditure, what happens, or doesn't happen between training sessions often fails to make headlines when the unexpected occurs to challenge your Plan. However, the lack of standardized and evaluated training still finds its way into the courtroom. Failed training often serves the plaintiff's counsel all too well.

In spite of this, many employers don't have the necessary resources to update their training every time they implement new policies or procedures. Sometimes key employees leave the organization or move to different positions and follow-though falls through the cracks. When management chooses to use paper-based messages to communicate important changes, no one really evaluates and documents the messages. Mix all the reasons companies fail to keep employees abreast of updates and new policies, or ensure comprehension, and you will find a recipe for disaster, in spite of all the money spent on training.

The good news for management comes from recent significant changes to training. So-called "traditional training" has begun to evolve into "web-based training". As one form of eLearrning (electronic learning), web-based training (WBT) offers a significant paradigm shift stimulated by the use of the Internet.

MONEY MATTERS...

The most significant and effective changes in training have occurred with the increased use of the Internet as a corporate tool for sourcing, research, market analysis, and communications. Why? Using the Internet for training offers a quick, easy to use, accessible, and *incredibly cost-effective* method. Even with the market fall, Wall Street remains convinced that WBT will trounce e-mail's use of bandwidth by 2005. All of the Fortune 1000 companies have implemented or have begun experimenting with WBT as a tool for corporate communications and performance improvement.

Imagine training individual employees in a hundred locations for less than a dollar each! Imagine having the ability to evaluate and document employee's comprehension and manage their learning with a simple to use, always-accessible specialized database known as a Learning Management System (LMS). And, costs continue to drop as new systems hit the market. Although recent reports put the common cost of implemented LMS's between $200,000 and $2 million, many hosted solutions have begun arriving on the market that do not require nearly this level of investment to implement. Imagine knowing that you can now efficiently implement you Master Plan, the one that you have labored over to make the most effective, because you now have the previously missing piece of Fire Protection Management under control – employee training and guidance.

You can research many publications that study the benefits and features of web-based training. Most have concluded that the savings over traditional training costs range 60-80%. This is a significant savings, particularly because the monetary gains don't result in loss of quality or reduced effectiveness. In fact, the savings come with a high level of accuracy in delivering and tracking the information that is so critical to the plan. Amazingly, you can even do this on a *customized basis.* That's right, WBT can easily be customized to each and every site, and tailored to specific groups of employees.

WEB-BASED TRAINING KEYS...

If this good news makes you feel enthusiastic about exploring how you can transition to web-based training, or even use WBT to augment your existing traditional training (called "blended solutions"), then you need to understand the various dimensions of this type of training, and how to select the most effective program for your organization.

> *The most significant and effective changes in training have occurred with the increased use of the Internet as a corporate tool for sourcing, research, market analysis, and communications*

Pic courtesy of Hughes Associates, Inc.

As with all paradigm shifts, pitfalls and plenty of misleading information abounds. Some of the areas that you most need to understand include the ones that follow:

- Experts often measure WBT courses by "seat time," or the amount of time you can sit in front of a computer and effectively absorb the material. Usually, course designers that follow best practices will limit a course to only 20-minutes in length. This equates to about 40-50 web pages. Further, a 20-minute WBT course roughly equates to one hour of classroom training, with no loss in comprehension. Why? WBT has fewer diversions. Well-designed WBT also requires the constant interplay and response of the user. This facilitates comprehension. *Look for programs that have deep levels of interaction for students to test their understanding and tools that allow for in-depth information transfer directly and indirectly related to the training course.*
- Costs for course development can vary widely. Many course developers use poorly adapted software. These developers require many months to develop even a single course, obviously at a very high cost – usually in the $12-$21k range. *Investigate vendors that can develop in the $6-8K range because of their subject-matter expertise. Make sure to ask questions about your required modifications and how quickly and inexpensively the developers can incorporate these modifications into a programmed course.*
- Courses can only prove as effective and interesting as a developer makes them. When computer programmers create or overly influence the instructional design, as opposed to an instructional design influenced solely by a subject matter expert (SME), the course will become off-target and boring. Watch out for development or delivery of a course not written by a SME. Do not pay hefty fees to "program a draft", and then pay even higher costs for small changes. Lots of WBT vendors fail to mention their high cost to keep the courses up-to-date, or to add a page of information. *Shop for a vendor that offers course-authoring tools that either support an SME's course development, or a vendor that has SMEs that know your industry and the specific fire protection issues at hand. Also find a program that allows for quick, inexpensive modification at page level – including graphic, text, and course layout changes. Avoid buying services or software that require significant fees for sending back the changes to a programmer, causing significant time delays. A few fire protection engineering consulting firms can assist you in finding the right program that fits your company's needs. Authoring tools exist that actually allow for quick and easy modification at the page level using simple MS Word templates! Remember, making changes can be very costly if you use the tools that require re-programming that, in turn, takes more than an hour. Software now exists that will fully program a 50-page web-based training course in less than 10-minutes.*
- The Learning Management System (LMS serves as a critical component of WBT. The LMS delivers the courses to employees, tracks their progress and quiz scores, allows you to deliver course sets to any department in your organization concerned with specific employee issues, and allows a secure, hosted to host the courses. The LMS does all this, and still permits employees to access the courses via your internal website or intranet! Imagine, no burden on your IT department. Cost for hosted services are based on "per user" fees, average about $150 for 1000 employees. These cost drop for larger companies, down to the $60 range. *Look for a package that offers an LMS with user-friendly reports for management. Choose and LMS that offers easy and inexpensive customization. Make certain the LMS allows for individual portfolios for your employees that show what courses they have taken, what their scores they have on quizzes, when they must retake a course and how long they have to complete the course or course set. Also, make sure the LMS can group courses into sets – for certificate programs – or based on job functions.*

> *Shop for a vendor that offers course-authoring tools that either support an SME's course development, or a vendor that has SMEs that know your industry and the specific fire protection issues at hand*

A DIFFERENT VIEW OF TRAINING...

Hopefully, you now have a greater understanding of how web-based training can serve as a superior means of supporting your Fire Protection Management Plan. With this knowledge, you can start to focus on all fire protection issues of concern. You can rest assured that the value of your training dollar will extend to areas of improvement, even when only the unexpected can truly measure the effectiveness of your Master Plan. Imagine, no surprises.


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What do the Beatles have to do with Passive Fire Protection?

By Graham Ellicott, Chief Executive, Association for Specialist Fire Protection (ASFP)

Spray applied cementitious materials applied to steel beams. Pic by kind permission of ASFP member – Cafco International.

What do the Beatles have to do with Passive Fire Protection?

To gain the answer to this unlikely sounding question it will be necessary for you to read this article and there are no clues at this point where the connection will crop up!

The long-term performance of passive fire protection in commercial buildings is key to them remaining safe, as the structure and the compartmentation must be able to withstand the ravages of fire for the prescribed time to allow the occupants to escape. Firstly a brief reminder of the requirements from the Building Regulations with regard to fire; buildings should:

- Be protected from collapse for a specific period of time
- Be subdivided into areas of manageable risk
- Have adequate means of escape
- Have fire separation between adjacent/adjoining buildings.

Passive fire protection plays a major part in achieving the above objectives via the protection of structural steel in a building.

And via the installation of fire rated barrier systems such as partitions, fire doors, fire curtains and penetration sealing systems.

A recent DTI sponsored Partners in Innovation project has found that in existing buildings the level of structural steel fire protection is generally acceptable and that any problems are associated with the application phase of the work. These are found with the fixing systems for boards, the thicknesses of sprayed cementitious products and variation in dry film thicknesses of intumescents.

These problems can be avoided by the use of third party inspection during the application phase of the project. This inspection lends backing for the Certificate of Conformity that is issued by the installer at the end of the job. Thus for any readers that are currently involved with the development of new commercial property you should ask that that the passive fire protection be installed by a third party accredited applicator as this will ensure a level of independent third party inspection. How many readers of this article will have been brought up with the Beatles or will at least be aware of their music?

In 1967 the Beatles released the seminal album (for any younger readers these are now known as CDs!) Sergeant Pepper's Lonely Hearts Club Band. This album contained a track called 'A Day in the Life' whose lyrics contained the line 'Four thousand holes in Blackburn, Lancashire...'. You may well now ask, "What does this have to do with the fire protection of modern commercial buildings?"

Good question, well it is a safe bet that if you went into any sizeable existing commercial building in Blackburn, or for that matter in any other large town in the UK, you would find many (perhaps four thousand, perhaps more, perhaps less) un-stopped holes in fire rated partitions where services such as pipes, fibre optic cables etc. pass through. This indeed was the finding of the aforementioned Partners in Innovation Project.

These unstopped holes in the main have been caused by work carried out after the installation of the fire rated partitions. This may have been due to following trades in the construction phase of the building, or by renovations after the building has been handed over to its owners.

Further on in 'A Day in the Life' the Beatles go on to say 'And though the holes were rather small', and thus you might again ask in view of their size, does it matter whether these holes have not received the appropriate fire stopping solution? The answer is that any gap around a service can allow smoke, hot gases and/or flame to pass through

Typical bad practice, a cable tray passes through a fire rated partition that has not been fire stopped. Ask yourself the question how would your insurers view this bad practice?

into the next area. Thus in the event of a fire the rate of spread is greatly accelerated by the presence of breached fire rated partitions.

The Building Regulations require that "All openings for pipes, ducts, conduits or cables to pass through any part of a fire separating element should be:

- Kept as few in number as possible, and
- Kept as small as practical
- Fire-stopped (which in the case of a pipe or duct, should allow for thermal movement)

As part of the Workplace Regulations, as amended in 1999, all building occupiers are required to undertake a risk assessment of their buildings and to maintain the assessment in an up to date manner – even where a Fire Certificate exists for the building. Yet incredibly, a recent survey carried out by the Chief and Assistant Chief Fire Officers Association (CACFOA), highlighted that as many as 40 per cent of building occupiers are unaware of their duty in this matter and that a larger percentage had simply not undertaken the work! Have you carried out your risk assessment? This risk assessment will highlight where any shortcomings exist in the building's passive fire protection, but where do you start to look for the location of the fire protection systems? Firstly refer to the drawings of the building, if these are not readily to hand try looking in the CDM (Construction Design and Management) file. If they are not there then contact the constructor of the building, of course if the building is very old this may be impossible. In this case you should consider calling upon a competent person to come and inspect the building and then prepare detailed drawings showing the location of the passive fire protection. In some cases the passive fire protection may also have been marked in-situ. Once the drawings have been located or created the passive fire protection should be inspected.

In order to fully inspect the passive fire protection in your building you need to examine the hidden areas, such as those above false ceilings.

Having found the areas where the PFP is deficient an action plan should be developed to remedy the problems.

In summary to get the best out of the passive fire protection in your building throughout its lifetime:

- Locate the passive fire protection
- Inspect the passive fire protection as part of your risk assessment
- Draw up an action plan to remedy any deficient passive fire protection

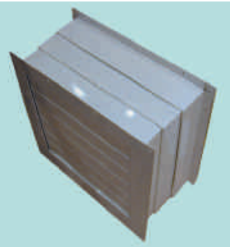
But don't forget to plan for the future, for instance every time you upgrade your computer network it is likely that fire rated partitions will be breached to pass through new cabling. In addition any old cabling should be removed as to leave it in place is to add to the fire load in the building.

By the way the first line of the Beatle's 'A Day in the Life' is 'I read the news today oh boy'.

Would you want your building to be headline news because it burnt down due to the lack of properly installed and maintained fire rated passive fire protection?

Sealed gaps around services that pass through fire rated barrier systems.

LPG LAUNCHES NEW AUTOMATIC PRESSURE RELIEF DAMPERS



LPG, the Spanish manufacturer of fixed fire suppression systems is expanding it's range of products with the developing of automatic pressure relief dampers.

The discharge of a fixed extinguisher system that uses pressurised gas as the extinguishing agent creates on discharge a considerable increase in the volume of gas in the area being protected, thus causing an increase in pressure in the room. This effect may cause structural damage to the area being protected, which makes it evident that there is a need to limit this increase in pressure through the installation of pressure relief dampers.

LPG pressure relief dampers do not require any type of signal or external components in order to work. When a discharge takes place, the increase in pressure within the room causes the dampers to open, thus easing the overpressure. When the pressure decreases, the grilles in the damper close, making the room airtight.

MAIN FEATURES:

- Design according to UNE, ISO, NFPA, CEA and BRITISH STANDARD regulations.
- Temperature resistance up to 1000°C for 2 hours.
- Adjustable to walls of different thicknesses.
- Simplicity of the system.
- Automatic action device.
- Good level of airtightness.
- Aesthetic appearance.

BENEFITS:

- Easy to install.
- Low inspection and maintenance costs.

The pressure relief area has to be calculated to avoid structural damage in the enclosure but without under any circumstances compromising the capacity for maintaining the concentration of the extinguishing agent for a period of time sufficient for putting out the fire.

For more information please contact:
LPG Técnicas en Extinción de Incendios, S.A.
Tel: +34 93 480 2925
E-mail: marketing@lpg.es

EXPLOSION AND HYDROCARBON FIRE

There is currently no legislative requirement within the UK, Europe or US for structural steel assemblies (where gas, oil and chemicals are not a hazard) to have any testing or approval against the effects of explosion and/or hydrocarbon fire. However since the events in New York on September 11th 2001 many questions have been asked about the protection of tall buildings around the world. In order to provide an additional level of confidence and to address these questions in advance of any specific requirements FIRETEX M78 has been subjected to the following tests.

Gas Explosion – A universal steel section 254x254x132 Kg/m^2, 1.6mtrs long and HpA 90 m^{-1} was coated with a 90 minute cellulosic fire protection thickness of FIRETEX M78. This was subsequently delivered to Advantica Technology (formerly British Gas Technology) who have an outdoor test facility within the R.A.F. base at Spadeadam in the UK. The steel section was then subjected to a gas explosion generating an overpressure of 1697 mbar in a 182 m^2 explosion chamber for a duration of 104 msec. The test was witnessed by Warrington Fire Research.

Result – Advantica Report No.5539 – The relative severity of this blast test was demonstrated by the fact that it could only be observed at a safe distance of approximately a quarter of a mile. The test specimen and intumescent coating was unaffected by the explosion and Advantica reported that "There was no damage to the specimen due to the overpressure generated by the gas explosion".

Hydrocarbon Fire Testing – Immediately after the blast test WFRC signed and dated the test specimen which was subsequently removed from site for hydrocarbon fire testing. The specimen was then hydrocarbon fire tested (again witnessed by WFRC) alongside a control specimen coated with the same thickness of Firetex M78 which had not been subjected to the explosion.

Result – WFRC Report No.C128566 – During the H/C fire test the time to reach 550°C for the section which had undergone blast testing was 51 minutes and the control section 53 minutes, i.e. no significant difference. WFRC reported "It is noted that the performance under hydrocarbon heating conditions appears to be in the region of 50-60% when compared to that achieved under cellulosic heating conditions."

Conclusion – FIRETEX M78 provides additional confidence beyond any legislative requirements. FIRETEX FB120, M782 and F908 have also been subjected to the above test regime with similar results and conclusions.

For more information please contact:
Leighs Paints
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THE HI-FOG TUNNEL SOLUTION

MARIOFF's HI-FOG tunnel concept is based on utilising high-pressure water mist sprinklers together with water mist curtains. The sprinklers activate at the location of the fire whereas the water mist curtains restrict the heat spread and consequent activation of sprinklers further away from the fire. A thermal bulb activated sprinkler system, divided into zones with water mist curtains, will self-activate in the right location without complex detection interfaces. This means that the water flow requirement is minimised, small size piping can be used, and installation is straightforward.

In the fire tests carried out by Marioff, the correct zone was quickly activated, no additional sprinklers were activated, and the temperatures were quickly cooled down and kept at safe levels. In order to operate, the system requires no additional detection and the pump-unit for a tunnel of 10km would be a similar size to that fitted on a large cruise ship. Any length of tunnel can be economically protected with HI-FOG water mist. For tunnels with a detection system, a zoned deluge system is available.

Water mist is ideal in tunnel fire protection thanks to its efficient cooling capabilities. It quickly makes the thermal conditions much more tenable for evacuation and for rescue. Fire tests and calculations show that there are usually 'false' activations of conventional sprinkler systems even at large distances from the fire caused by hot gas currents. This would put enormous demands on the water flow, making a conventional system totally impractical for long tunnels. High pressure water mist has been proven to operate effectively within typical wind conditions of road and rail tunnels.

For further information, please contact:
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- UL Approved Solo™ Aerosol possesses all these qualities. Do others?
- Solo™ Aerosol conforms to requirements for both new BS5839-1:2002:

"Since stimulus of the sensing element…forms part of the test, use of a test button or a test magnet does not satisfy the recommendations given."

"Point smoke detectors should be functionally tested by a method that confirms that smoke can enter the detector chamber and produce a fire alarm signal. It should be ensured that the materials does not cause damage to, or affect the subsequent performance of, the detector."

And also NFPA 72 1999 Table 7-2:

"Detectors shall be tested in place to ensure smoke entry into the sensing chamber and an alarm response"

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- Solo™ Aerosol research programme uncovered alarming facts regarding other smoke test aerosols. Flammable ones could ignite and others left a sticky residue on the detectors, which could cause damage the detector plastics or sensitivity drift.
- Solo™ Aerosol – the professional solution

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RELIABLE announces the K-22 Magnum Early Suppression Fast Response Sprinkler (ESFR) which has been optimized for use in 13.7 m (45 ft.) high buildings, eliminating the need for in-rack sprinkler protection. This sprinkler is intended for protection of Class I to IV Commodities and Group A and B Plastics, which includes cartoned unexpanded plastics. The K-22 is designed to respond quickly to growing fires with a high volume of water discharge to suppress rather than control fires at lower pressures and without in-rack sprinkler protection for 10.7 m (35 ft.) to 12.2 m (40 ft.) storage as is required with ESFR sprinklers having nominal K-factors of 200 (14.0) or 243 (17.0). The K-22 is Listed by Underwriters Laboratories Inc. and UL certified for Canada (cULus) for installation in accordance with National Fire Protection Association (NFPA) Standards for storage heights to 12.2 m (40 ft.) in buildings with roofs/ceilings up to 13.7 m (45 ft.) high. The K-22 is also Factory Mutual (FM) Approved for use in buildings up to 13.7 m (45 ft.) high with storage heights to 12.2 m (40 ft.) when installed in accordance with FM Loss Prevention Data Sheet 2-2 or other FM Installation Standards.

Having a K-factor of only 320 (22.4), the Reliable K-22 ESFR provides K-25 ESFR protection at lower flow requirements. Minimum system design savings over a K-25 ESFR is 818+ L/min (216+ gpm) for cULus and 908.5+ L/min (240+ gpm) for FM Approval. These lower flow requirements provide the opportunities to reduce interior and underground pipe sizes, fire pump sizes, and tank sizes. The K-22 enables a maximum ceiling to deflector distance of 457 mm (18 inches), has a R1 (1" NPT) thread, and is available in 68°C (155°C) and 93°C (200°F) temperature ratings.

For more information, please contact:
Reliable Fire Sprinkler Ltd
Tel: +44 (0)1372 724461
www.reliablesprinkler.com

SAUDI FACTORY FOR FIRE EQUIPMENT CO (SFFECO) is an ISO9001 certified manufacturing unit. It is a specialised manufacturer of fire extinguishers, fire hose cabinets and other fire fighting equipment. Having a modern state of the art manufacturing plant in Riyadh has helped SFFECO build a reputation as being a very professional company as well as being one of the market leaders in the production of fire protection products.

Our product range includes, portable and mobile extinguishers, hose reels and cabinets, fire pumps, hydrants, foam, CO_2, clean agent systems, fire doors, as well as dry and wet riser equipment.

SFFECO's decision to seek CE/KITEMARK approval was driven by both the companies desire to prove it's product quality and reliability and also to satisfy specifiers demands for reputable product certification. As such, all of our portable fire extinguishers are CE/KITEMARK approved and certified. Our hose reels are EN671 approved.

SFFECO currently employs over 450 people who each insure the ongoing success of the company.

For more information please contact:
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Tel: +966 1 265 00 70
www.sffeco.com

TUNNEL FIRE DETECTION SYSTEMS FROM SECURITON SWITZERLAND

Based in Switzerland, **SECURITON** has been dedicated to the electronic fire detection since 1948. SECURITON develops and manufactures a large range of different fire detection systems to fulfill broad customer needs. These range from tunnels, commercial buildings, industries, telecommunication, utility stations and others. Today, hundreds of tunnels are protected by SECURITON Fire Detection Systems worldwide.

Tunnel Fire Detection – Heat Detection with Linear Heat Detector The SecuriSens TSC 511 fire detection system features fast and reliable fire detection. Based on the principle of temperature differential measuring, efficient operation is guaranteed under very harsh ambient conditions such as dust, humidity, corrosive gases and high electro-magnetic interference.

The PU-coated sensor cable holds semiconductor type temperature sensors. The sensors are located at regular distances (typically 7.2 m) and are continuously measuring the ambient temperature. The temperature sensors are monitored via the LISA communication bus and continuously polled for the actual temperature value. The TSC 511 system software evaluates temperature variations and activates alarm signals. The tunnel temperature profile can be visualized on a standard PC.

For more information, please contact:
Securiton AG
Tel: +41 31 9101122
www.securiton.ch

THE ITALIAN JOB

The State Archives of Venice, including documents studied by Benjamin Franklin in formulating the American Constitution, is being protected from the threat of fire by a VESDA system from **VISION FIRE & SECURITY**.

VESDA aspirating smoke detection is the ideal technology to protect valuable or irreplaceable documents due to its high level of sensitivity. In this application, not only the documents could be irrevocably damaged by fire – the archive is located in the ex-monastery of 'Santa Maria Gloriosa dei Frari', dating back to the 11th Century. Early smoke detection is also vital to prevent potential damage to this valuable historic building.

Sigma Controls, the distributor for VESDA in Italy, worked with the Ministry of Italian Cultural Artefacts, the Commission for the Protection of Venice and the Order of the Engineers of Venice on the two-year project to install the fire detection system.

It features 35 VESDA LaserSCANNER detectors, connected to a VESDAnet closed communications loop, controlled by a central panel located in the Archive control room. The system is linked to Sigma's office in Milan via a modem. VESDA LaserSCANNER was chosen for this application due to its ability to identify which of its four-air sampling pipes detects smoke.

The Archivio Di Stato Dei Frari was founded in 1815 to provide a central point of storage for the documents of the magistracies and offices of the Republic of Venice. Some documents go back as far as 400 AD, the time of the Roman Empire, and therefore provide an invaluable source of information for scholars researching Venetian life.

Vision Fire & Security is a member of the Vision Systems Group, which manufactures a range of high-value products, contract engineering and technology-based services for worldwide markets. With headquarters in Melbourne, Australia, Vision Systems also has offices in the UK (supporting Europe and the Middle East), the USA and Asia Pacific.

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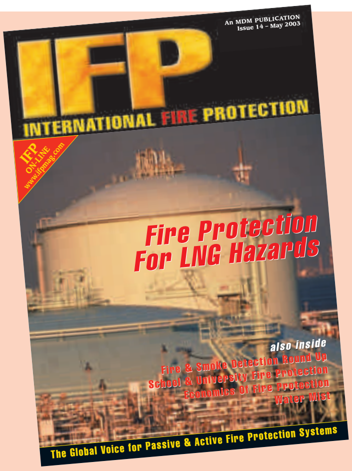

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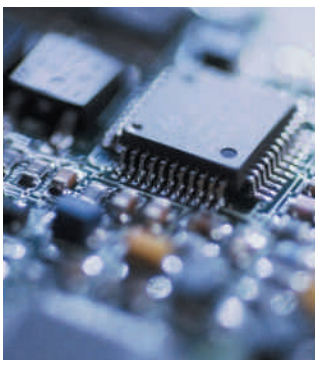

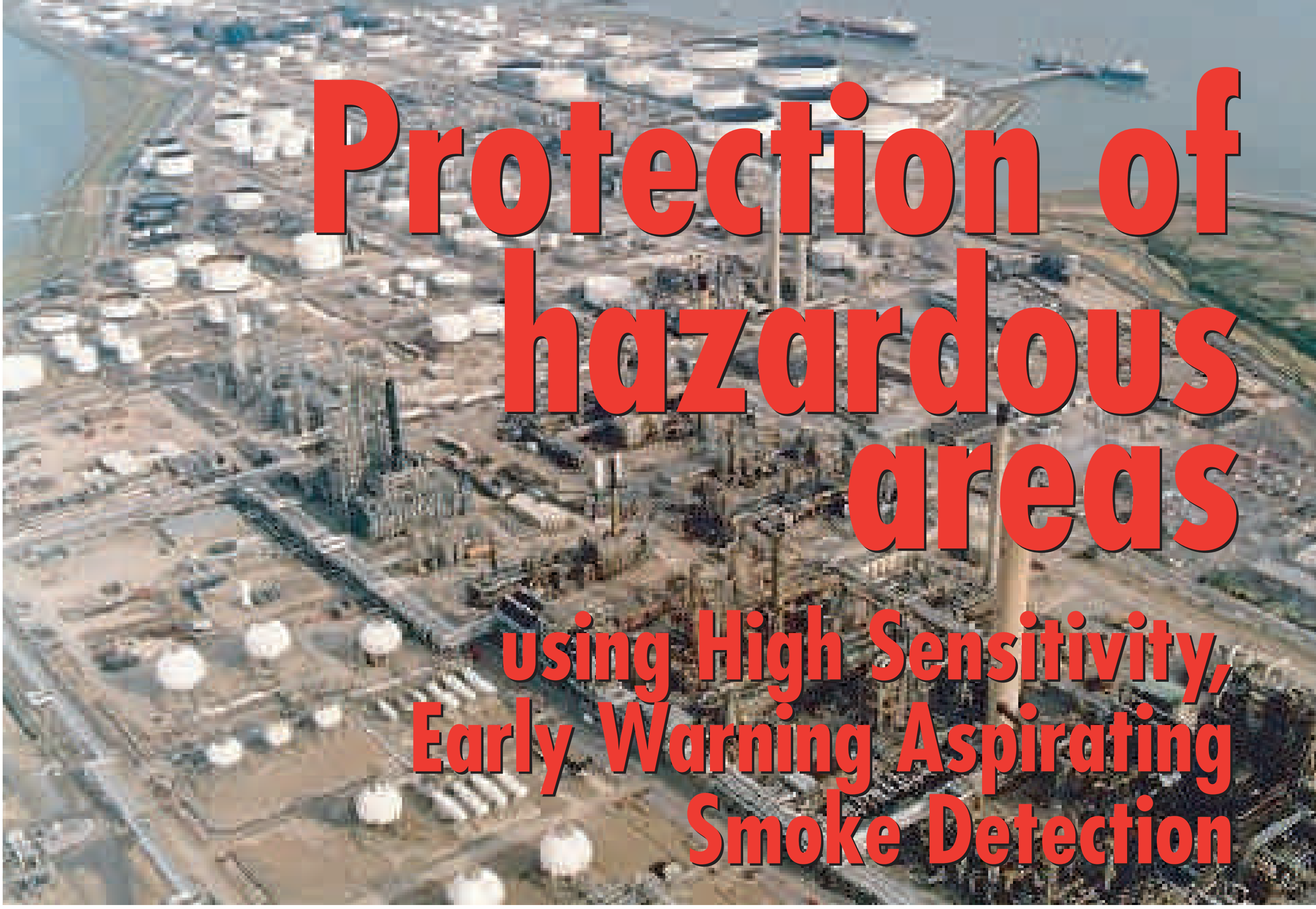

Protection of hazardous areas

using High Sensitivity, Early Warning Aspirating Smoke Detection

A petrochemical site.

Pic courtesy of Vision Systems (Europe) Ltd

By Peter Massingberd-Mundy, M.Eng, C.Eng, M.IMechE

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SUMMARY

Most Fire Engineers, Consultants and Fire Prevention Officers know what an aspirating smoke detection (ASD) system is and can describe a centralised smoke detector with a fan or aspirator drawing air samples from the protected area through holes in a 25mm pipe running above the protected area or across the air intake grille of an Air Handling Unit (AHU).

What many may not appreciate is the increasing diversity of applications for which these detection systems are being used and the major benefits they can offer.

This article highlights the major benefits of high sensitivity ASD systems and then concentrates on its application in high risk hazardous environments particularly with regard to meeting the imminent requirements of the ATEX Directives.

HIGH SENSITIVITY ASD SYSTEMS

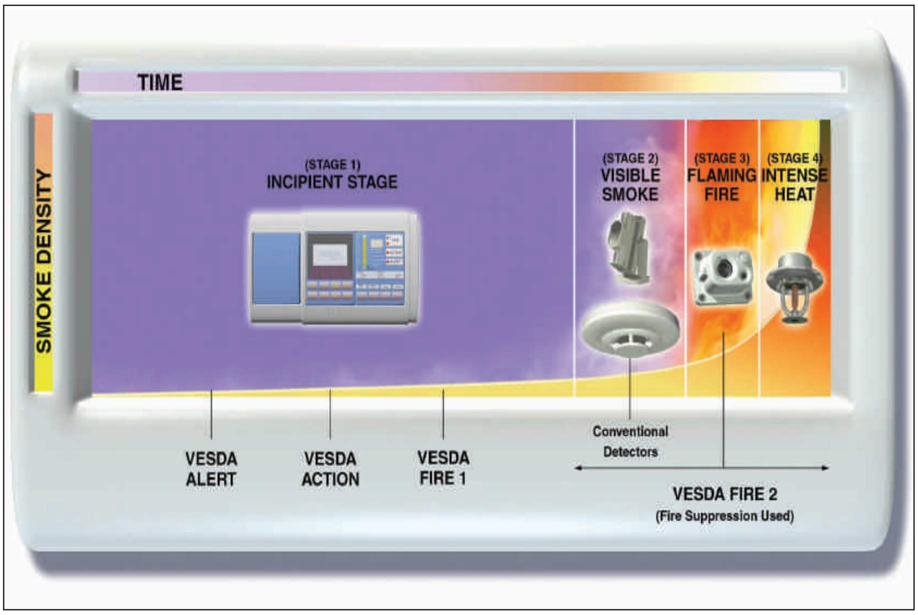
In their simplest form ASD systems are easy to understand; they continually draw samples of air from the equipment or area requiring protection and assess these samples for the presence of smoke. Many variations exist with benefits and features that match the price you pay. Naturally the fan or aspirator used to transport the samples into and along the sampling pipe is sized to reflect the maximum pipe runs (which can be up to 200m) but more importantly, the sensitivity of the central detector is key to its performance capability.

ASD systems can have many holes in the sampling network. In order to have confidence that each hole has *at least* the equivalent performance to a point detector the scenario of smoke only entering one hole must be considered. In this case all other holes will be drawing clean samples and the sensitivity of the central detector must be sufficient to account for this dilution.

Illustrating this with figures: consider a 20 hole system with equal quantities of air entering each sampling point. To have an effective sampling point sensitivity of 4%/m – which is widely considered to be *normal* for a *standard* point detector – the central detector must have a Fire Alarm threshold of 0.2%/m.

This illustration shows how an aspirating system with multiple holes must have a high sensitivity detector to match the performance of the generic point detectors. However, one of the unique benefits of an aspirating system is its ability to detect lower concentrations of smoke than a normal point detector when smoke enters more than one sampling point. In this case the smoke concentration at the central detector is less diluted. As a result, Aspirating Systems have a natural ability to detect diffused smoke – the more diffused the smoke is the more sampling holes it enters. This is known as the cumulative effect.

To illustrate with figures: Consider the 20 hole system. If 2%/m smoke enters 2 holes then the detector with its sensitivity set at 0.2%/m will declare an alarm. If 1%/m smoke enters 4 holes the 0.2%/m detector will similarly declare an alarm. And so on.



Fire Growth Curve.

While this cumulative effect is an important feature of all ASD systems it does not in itself provide the early detection capabilities on which the good reputation of high sensitivity ASD systems is founded. This reputation is built on the utilisation of very sensitive central detectors to give alarm warnings that are significantly earlier than conventional detectors – even when smoke is only entering one hole. It should be noted that the discussion and illustrations thus far relate to the ALARM condition. For true early warning what matters is *not* that the ASD system can match and in many cases exceed the performance of a point detector – what really matters is that it can provide a warning as soon as any abnormal conditions are discernable.

In this context, Early Warning should not be confused with Pre-alarm. Pre-alarm provides an indication that an ALARM condition is approaching. Early Warning provides an indication that normal conditions are no longer present – something unusual is happening.

This is best illustrated by considering the multiple alarm outputs available on the top range ASD detectors.

MULTIPLE ALARM THRESHOLDS

First level Early Warning alarm *Alerts* key personnel to a potential problem – perhaps the on site security staff are informed of the condition and/or the local room occupants are alerted to the unusual conditions. The response to this Alert warning might be that local personnel stop an unapproved activity (e.g. soldering) thereby avoiding an unnecessary evacuation of the premises. They might not find the source of the "thermal event" first time but after a number of incidences the warning might be traced, say, to an electric heater. Depending on the particular site the source of the alarm can be removed or the alert threshold can be permanently adjusted to compensate for this regular occurrence.

If the smoke condition continues to escalate then a second stage warning is generated – this is the Action Alarm. Generally this is configured to raise a pre-alarm warning on the central panel, the CIE (Control and Indicating Equipment). Local personnel might be expected to inform the relevant authority if they have identified the source and ask for the unit to be isolated temporarily until the cause is under control. Depending on the particular application they may be required to prepare for the full alarm condition. For example, procedures in an office might direct them to close windows, shut down PCs, and warn other personnel in the area that a fire Alarm is imminent. The underlying message is "take action". In an IT or industrial application the Action alarm may start to initiate back up procedures or shut down machinery.

After these vital early warnings (that are only available on top range ASD detectors) there is the Fire condition. This is generally connected as an Alarm input to the central panel and is often considered to be equivalent to the standard point detector response. On some ASD systems that have a wide sensitivity range a fourth alarm level is also available that can be interfaced into automatic suppressions systems. Such detectors can therefore provide multiple alarm outputs that can initiate the appropriate response.

APPLICATION OF ASD IN HIGH RISK AREAS

The reputation of High sensitivity ASD systems originates in the protection of the high risk, high value environments of Telecom switches and Electronic Data processing areas. These areas typically have large Air Handling Units for cooling the electronic equipment and, due to the dilution of any smoke by the large airflows; effective smoke detection is only practical using high sensitivity systems. Over the years, the technology has been applied successfully in many

Hazardous Area Detectors. *Pic courtesy of TEPG*

VESDA Exd product image. Pic courtesy of Vision Systems (Europe) Ltd

other areas where business continuity is critical and/or where risks and potential losses are high. Examples include warehousing, cold stores, industrial processes, cable tunnels, production machinery, wet benches and prison cells.

One specific example of the growing adoption of ASD systems is in hazardous areas. Generally these areas by their very nature fall into the category of high risk and they are often critical to the business continuity. PetroChem plants have many hazardous areas; warehouses storing solvents and alcohol also have classified areas, which require specialist fire detection products. Essentially these are areas where explosive mixtures of gases or vapors can accumulate which if ignited would cause an explosion.

ASD IN HAZARDOUS AREAS

Within Europe there have historically been different approaches to Ex environments within different member states. However, with the imminent mandatory CE marking of Electrical equipment installed in hazardous areas under the ATEX directive there is some harmonization and renewed emphasis on the suitability and application of electrical equipment in such areas. There are many web pages devoted to the full explanation of the ATEX Directives, of which there are two, as summarized (see tables, right and over).

In summary equipment installed in hazardous areas must be CE marked and have appropriate Ex rating. There are a number of alternative approaches to Ex ratings (ref. EN50014).

ATEX 95, the "equipment" Directive (94/9/EC) specifies the Essential Health and Safety Requirements for equipment that may be used in an explosive atmosphere.

It places requirement on manufacturers of such equipment both in terms of performance *and* product quality, which was not included in the majority of the national requirements that preceded it.

The essential safety requirements for equipment covered by the directive include requirements for the selection of materials, marking, user instructions and design and construction. Typically manufacturers will use the appropriate European and/or international standards to demonstrate their compliance with many of these essential requirements.

The directive defines a number of categories, which correspond to the classification of the hazardous areas in which the equipment is to be deployed. However, it is important to realise that there is no direct relationship defined in the directive between the area zoning and the category of equipment, which must be used.

The full list of ATEX categories are as follows (there is a sub-division which separates equipment for use in mines from all other equipment) where the final column provides a link to the zoning classification.

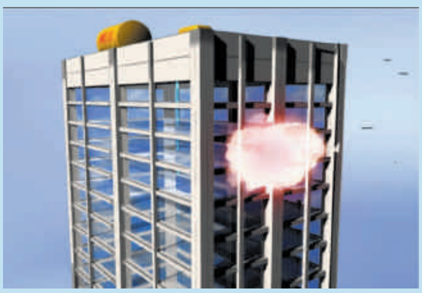
Group	*Category*	*Locations*	*Comments*	Zone Classification common in Europe (Based on IEC 60079-10)	
I	M1	Mines	capable of functioning safely in the presence of an explosive atmosphere	n/a	
I	M2	Mines	must be de-energised when an explosive atmosphere is present	n/a	
II	1	Other	protection assured in the event of two independent failures	Zone 0	Explosive atmosphere will be present continuously
II	2	Other	protection assured in the event of foreseeable failures	Zone 1	Explosive atmosphere will be present some of the time (e.g. due to operational reasons)
II	3	Other	protection assured during normal operation	Zone 2	Explosive atmosphere may be present (e.g. in the event of a fault)

Equipment intended for use in the higher risk categories is required to undergo independent certification by a Notified Body (an independent and suitable authorized certification body). Equipment for lower risk categories may be self-certified by the manufacturer in order to affix a CE mark to the product.

The actual relationship between the category and the certification requirements is as follows:

Category	*Requirement*
1	Product certification and review of quality control system by Notified Body required
2 (electrical)	Product certification and review of quality control system by Notified Body required
2 (non electrical)	Self-certification by manufacturer permitted supported by Declaration of Conformity and Technical File
3	Self-certification by manufacturer permitted supported by Declaration of Conformity and Technical File

- Intrinsically safe (Exi) equipment limits the electrical energy in the devices installed in the area so that no significant spark or overheating can occur, which may ignite an explosive atmosphere.
- Pressurized apparatus (Exp) prevents explosive mixtures reaching the potential source of ignition by means of a positive pressure within the electrical enclosure.



Flame arrester. *Pic courtesy of AMAL*

- Flameproof enclosures (Exd) contain ignition sources in such as way that any ignition of the hazard inside the enclosure will not be transmitted to the atmosphere outside the enclosure.
- Increased Safety (Exe) use mechanical construction safeguards to ensure that the apparatus does not contain normally arching or sparking devices, or hot surfaces that might cause ignition.
- Oil immersion (Exo), Powder filling (Exq) and encapsulation (Exm) are other approaches that may be used.

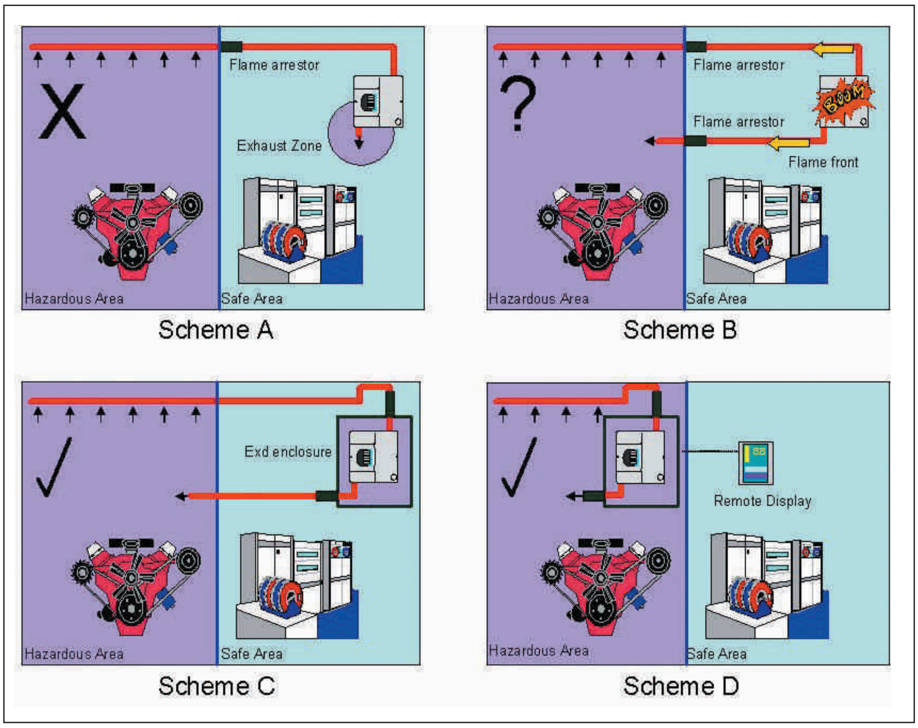
Fire detection products generally use either Exi or Exd protection. Most common are intrinsically safe smoke and heat detectors. Flame detectors and linear systems such as pressurized pipe or temperature cable/fibre are also available for such environments. However, none of these technologies can provide the Early Warning smoke detection capability of an ASD system.

When deploying ASD systems for the protection of hazardous areas some installers have previously tried to exploit the "remote sensing" capability of such systems by installing the detector in a safe environment and installing the electrically passive pipework in the hazardous area (as depicted in Scheme A) with a flame arrestor (see illustration) to protect the hazardous area from possible ignition through the pipe. There is clearly a problem with this arrangement in that the ASD system is exhausting the hazard into the safe area. To overcome this, the exhaust can be piped back to the hazardous area through another flame arrestor (Scheme B). However, serious consideration must be given to the failure mode of this arrangement in the event of an explosion. In accordance with ATEX 137, the behavior of the ASD

ATEX 137, the "user" Directive (1999/92/EC), is specifically concerned with worker safety and places requirements on employers whose staff may work in an explosive atmosphere

It places a number of requirements on employers. The main ones are to:

- assess explosion risks and draw up an explosion protection document (*Articles 4 and 8*);
- prevent and provide protection against explosions (*Article 3*);
- implement measures to ensure work in explosive atmospheres can be carried out safely (*Article 5*);
- coordinate the implementation of health and safety measures with other employers (*Article 6*);
- classify, zone and mark areas where explosive atmospheres may occur (*Article 7*).



enclosure must be considered in relation to the safety of personnel (and equipment) in the vicinity. Furthermore, the integrity of the pipework must be given due consideration in the event of flame front travelling from the detector towards the flame arrestors.

The best solution is to enclose the ASD detector in a flameproof enclosure and provide flame arrestors directly into the enclosure (as shown in Schemes C&D). In scheme C the detector is mounted in the safe area, which may be possible as long as the leak rate of the Exd enclosure is sufficiently low to ensure that the surrounding atmosphere does not become a hazard. In Scheme D the ASD is mounted in the hazardous area and a remote display is provided to provide information and interfaces within the safe area. Clearly Scheme D is the most appropriate but this does not preclude the use of other schemes where appropriate risk assessments are undertaken and recorded.

When designing the fire protection arrangements for hazardous areas the benefits of installing high sensitivity ASD systems are clear. The ability for these systems to provide early warning ensure the best possible protection for these high risk, high value areas. However, careful consideration of the explosion risks is essential and simply installing the ASD system in a safe area with flame arrestors in the pipework to the hazard may be flawed. The preferred approach is to install the ASD system in an Exd enclosure, which can be mounted in the safe area or the hazardous area depending on the particular site arrangements.

An Alternative Viewpoint – Editor's Note:

Following on from the article on Water mist testing printed on pages 52-56 of Issue 13 of *IFP* (also available at www.ifpmag.com). We were contacted by Jukka Vaari who did not entirely agree with methods used and reasoning made within the article. Here we give him the chance to challenge that article in print. We welcome such contribution from you the readers.

New performance evaluation methodology opens up a door for ineffective water mist systems

By Jukka Vaari, VTT Technical Research Centre of Finland

A NEW METHODOLOGY to evaluate fire performance of total flooding water mist systems[1] contains technical inadequacies that are discussed in this contribution. A serious concern is raised due to the fact that fire extinguishment is no longer included as a fire test requirement. It is argued that the methodology may facilitate ineffective water mist systems to enter the market.

The fire performance evaluation of fixed water mist total-flooding fire suppression systems has to date involved extinguishment of a series of test fires. Recently, however, it has been argued that time to extinguishment is a poor measure of the efficacy of water-based fire fighting systems[1]. This is because it is not a very repeatable quantity, and that under suitable conditions, free-burning fires may self-extinguish faster than when suppressed by a water based system. As an alternative, the determination of quantities called 'mixing', 'inerting' and 'cooling' is proposed.

The new approach contains severe inadequacies. Requiring fire extinguishment in test conditions is abandoned. The new concepts of 'mixing', 'inerting' and 'cooling' are not founded on a comprehensive technical analysis, and the criteria to tell an acceptable water mist system from an unacceptable one have not even been drafted. The methodology is devised based on pool fire tests only, and the validity of the approach to spray fires (the most common fires in real machinery spaces) is not known.

The significance of the time to extinguishment may be understood from Table 1, which presents the extinguishment time data from the fire tests used to develop the new methodology[2]. The data has been arranged to reflect the difference in extinguishment times between the tested high pressure (HP), low pressure (LP) and water spray (WS) systems. It is evident from the table that in terms of fire extinguishment capability, HP system performs better than LP or WS systems. Even though the repeatability of the extinguishment times is not good, the superiority of the HP system is, with one exception, consistently seen in the test data. This fact is downplayed by the new evaluation methodology, since extinguishment is not included as a requirement.

Table 1 reveals that the free-burn fires were generally extinguished faster than fires suppressed with water-based systems under similar test conditions. However, this conclusion is entirely particular to the case of closed vents, and it is severely compromised by the existence of open vents. For horizontal vents, the data of Table 1 shows that increasing the vent area significantly degrades the fire performance of all systems, and in some cases, fires will not be extinguished. For vertical vents such as doors (entirely neglected in the approach), fire dynamics tells us that a sustained (free-burn) fire is allowed whose size is limited by the ventilation factor of the opening. Thus for vertical vents, the argument related to the self-extinguishment times of free-burn fires simply falls apart.

The presence of a vent tests the ability of the suppression system to prevent the air inflow through the vent into the fire compartment. If the fire suppression systems are not effective against such scenarios, fires will be controlled rather than extinguished, which may arguably be enough in some cases. However, if the fire suppression systems have proven their *extinguishing effectiveness* in ventilated test enclosures, they possess an important safety factor in terms of fire performance with regard to the possible ventilation scenarios that may occur in real fires. Testing water mist systems in sealed enclosures and requiring control only will degrade the overall level of fire protection provided by these systems, and place more requirements for mobile fire fighting.

The proposed new evaluation method completely lacks the acceptance criteria. The need for a new methodology is justified by insisting that it would better sort out 'acceptable' systems from 'unacceptable' ones. Without acceptance criteria, this claim cannot be verified. An important benchmark test would be to subject existing, approved systems to an analysis according to the new methodology and see what would happen.

The proposed new quantities are either ill-defined, or not applicable to all water-based technologies. 'Mixing' is defined through a difference between the CO_2 concentrations at top and bottom parts of the test enclosure. In practice, the measurement neglects water vapour concentration in the gas sample. Any vertical temperature gradient in an enclosure (especially with larger fires) implies a difference in the water vapour concentration between the bottom and the top, affecting the 'mixing' parameter. Furthermore, it is not generally true that full mixing in terms of gas concentrations would imply full temperature mixing. 'Inerting' is defined through a mass measurement of the fuel pan. This definition neglects the effect of vitiation on the combustion efficiency, and is affected by water impinging on the pan. More importantly, it is not applicable to systems using foam additives. 'Cooling' is evaluated through thermocouple tree measurements. Thermocouples are routinely used in suppression experiments to measure gas temperature; however, water affects the TC readout which therefore may be not the same as gas temperature. This may affect the 'cooling' parameter, since not all systems discharge similar amounts of water (e.g. 60, 100 and 500l/min for the tested HP, LP and WS, respectively).

There are well-known limitations to the fire performance of total-flooding water mist systems due to the physical suppression mechanisms involved.[3] The limitations have been the root cause for attempts to implement dubious solutions 'to beat the fire test' in large test volumes, and it is perfectly agreeable to try and develop testing methods that would rule out dubious solutions from the market. However, it is highly questionable if systems begin to gain approvals not by improving their performance but by meeting new and less stringent requirements. Whether the SP proposal will mean an increase or a decrease in the level of fire protection remains to be seen. But a fair possibility exists that less effective systems become acceptable, especially if fire extinguishment under test conditions is no longer required.

References

1. Arvidson, M. and Hertzberg, T., 'New methods needed to evaluate the performance of water spray and water mist systems during fire testing', *IFP Magazine* February 2003 issue pp. 52-56.
2. Arvidson, M. private communication (2002).
3. Vaari, J., 'A Study of Total Flooding Water Mist Fire Suppression System Performance Using a Transient One-Zone Computer Model', *Fire Technology* vol. 37 no. 4 (2001) pp. 327.342.

Jukka Vaari has a PhD from Department of Technical Physics at Helsinki University of Technology. He joined VTT Fire Technology in April 1998. His main duties include full-scale fire testing and modeling of total-flooding fire suppression systems. He participates in the preparation of a European performance-based water mist standard, and in the work of the Fire Protection Sub-Committee of the International Maritime Organization. He is a member of the Scientific Council of the International Water Mist Association.

Table I. Fire extinguishment times (min:s) from the VINNOVA tests at $500m^3$ enclosure.[2] Two values indicate a repeated test. NO indicates no extinguishment. N/A indicates test was not conducted.

Fuel	Type	RHR (MW)	Vent	HP	LP	WS
Diesel	exposed	0.5	none	9:40	NO	NO
		1	none	5:12	NO	17:05
	obstructed	1	none	8:50	17:10	10:05
Heptane	exposed	1	none	8:00	15:50	NO
		2	none	3:55	4:21/6:08	N/A
	obstructed	0.5	none	26:18	33:15/NO	28:07
		1	none	8:47	12:30	10:40
			$2 \times 0.56m^2$	7:28/13:22	16:30/22:55	14:50
			$6m^2$	NO	NO	NO
		2	none	3:25	$3:1^2$	5:55/7:10
			$6m^2$	6:23	11:34	NO
FREE BURN TESTS						
Heptane	obstructed	0.5	none	19:25		
		1	none	7:55/9:03		
		2	none	3:40		

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LNG bulk storage tanks protected by specialised water-driven turbine high expansion foam generator systems.

LIQUIFIED NATURAL GAS (LNG) and LIQUIFIED PETROLEUM GAS (LPG) vapour forms a highly flammable mixture with air, and so an accidental spillage in the bunded (diked) region around a bulk storage tank poses a severe cryogenic fire hazard. The most widely accepted means of controlling such hazards is by using high expansion foam.

Such cryogenic liquids are in fact gases at normal ambient temperature and pressure, but are stored at very low temperatures, for LNG around –164°C, to reduce them into their liquid, rather than gaseous state. Clearly this makes processing, storage and transportation for distribution easier and more cost-effective.

THE HAZARD

LNG is 83–99% Methane which if ignited generates vast quantities of heat radiation very quickly (93,000kcal/m^3/hr), typically twice the heat produced by an equivalent quantity of gasolene/petrol. However, unlike petrol the volume increase of LNG gas from its liquid phase is around 600 fold.

Consequently, any accidental leakage of LNG boils instantly, gaining heat from its surrounding environment, the ground, concrete, pipe work and even the air into which it is rapidly evaporating. Initially the gas is heavier than air, but as more heat is absorbed with time, it gets closer to ambient temperature making the gas lighter than air. In this 'lighter-than-air' state the evaporating gas is carried away by the air currents and wind, and will ignite at very low concentrations in air (typically 5–15% by volume). It is therefore the edges of the gas cloud that are most likely to find an ignition source causing a risk of explosion and rapid burn back towards the evaporating liquid pool. Clearly the plant and its surroundings will be seriously damaged by the radiant heat flux, unless proper provision is made to protect against such spill hazards.

Liquified Petroleum Gases (LPG), comprising Propane and Butane, have a higher boiling point than LNG. Propane has a boiling point of –42.5°C (at 1Atm) whilst Butane is around 0.5°C so it does not boil off to a gas as quickly as LNG. In their gaseous state LPG's are always heavier than air so sink to ground level. Once evaporated the gas has a tendency to flow downhill and occupy hollows, basements, underground tunnels etc. They produce similar levels of heat radiation to LNG when ignition occurs. The flammable range of LPG is typically 2–9% by volume, so again it is the edges of the gas cloud along the ground, where fire will start. This could be several hundred metres from the leak source.

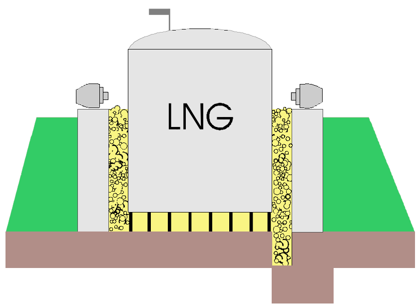
WHAT IS ADEQUATE PROTECTION?

There are two aspects to controlling such an LNG or LPG spillage.

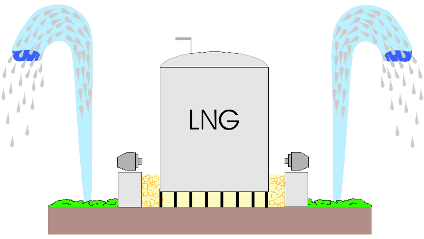
Passive Protection

Firstly the design of storage tank and its associated bunded or diked area to contain the spill is an important means of passive protection. A high bund wall serves to contain the LNG spill and disperse the vapour safely to high level. Sub-dividing the bund with low walls or sloping sides to a deeper trough will also help to minimise the surface area for evaporation of the LNG.

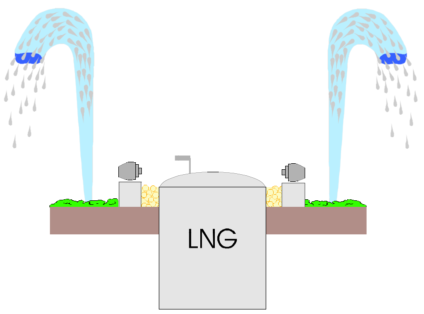
When the bund wall is low additional water curtain systems may be required to reduce the radiant heat flux to surrounding tanks and associated plant.



Angus Fire LNG Fixed Turbex units protecting LNG containment kit at PT Badak's huge Bontang facility in Indonesia.

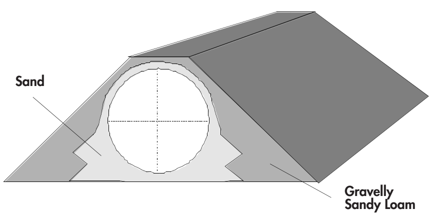


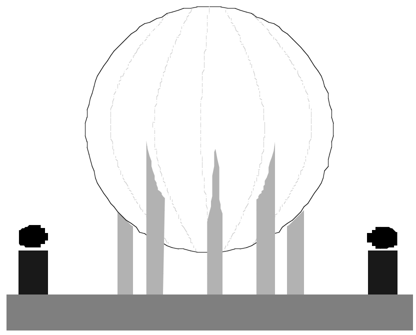
Tanks may be partially buried, often called 'in-ground tanks', with low bund walls to permit the production of high expansion foam onto the roof to minimise radiation effects. Water spray systems may also be installed to further minimise radiated heat flux to adjacent structures.



LPG on the other hand is predominantly stored in steel vessels called spheres or bullets either above ground or increasingly earth mounded.

Similar passive bunding may be used to contain any spillage but the primary





protection uses water spray systems to actively cool the vessels and retain their integrity reducing the risk of a BLEVE (boiling liquid expanding vapour explosion). Literally burying the tanks under mounds of earth reduces this risk further, keeps sunlight off the tanks and offers cosmetic benefits.

Active Protection

At the outset any active fire protection system for LNG must be designed for one of two scenarios – either vapour dispersion or fire control.

Vapour Dispersion

A high expansion foam system is chosen for vapour dispersion, to reduce the danger of an unignited LNG spillage by assisting effective upward dispersion of the vapours that are boiling off. This reduces vapour concentration levels at ground level where there is greatest risk of potential ignition. One must accept that if ignition does subsequently occur this dispersion system may be insufficient to provide fire control.

Fire Control

For fire control, a high expansion foam system is chosen to control the fire if ignition of the LNG spillage occurs, preventing catastrophic failure. This is achieved by means of a controlled burn off through the high expansion foam blanket that will also reduce the radiated heat flux to surrounding plant.

Clearly making the right choice here is crucial. Overall system cost for each of these two applications may well be a significant factor in this decision, since each system will need to have very different application rates, operating times and quantities of protecting equipment.

However, for LPG the vapours cannot be warmed by foam since they are always heavier than air, so fire control in the bunded area is the only situation where foam would be used.

The first requirement for any scenario is a suitable detection system, which must be capable of immediately identifying any spillage that has occurred. This should be linked to a suitably rapid method of warning all site personnel and emergency services of the spillage hazard. This detection system must also establish whether the spillage has ignited.

Time to initiate actuation of the fire protection system is a critical factor in all scenarios, whether for LNG fire control, LNG vapour dispersion or LPG fire control.

STANDARDS

International standards like the American National Fire Protection Association NFPA 11A:1994 and British Standard Institute BS5306 Section 6.2:1989 both recommend high expansion foam systems for the protection of LNG hazard areas but draw a cautionary note on LPG not to extinguish, since extinguishment by foam may occur. This would result in the evolution of heavier-than-air vapours draining off from below the foam blanket and danger of a vapour cloud building up, or reignition or both. Recognising the complexity of this cryogenic hazard, neither standard provides any specific application rates (a measure of how much foam is being applied to the hazard area each minute) or discharge times. NFPA 11A:1994 suggests that application rates should be established by tests, so that a positive and

Angus Fire LNG Fixed Turbex Systems providing rapid protection for LNG storage tanks at Sonatrach in Algeria, the world's largest exporter of LNG.

progressive reduction in radiation is achieved within the time limitations established in the analysis. This should be increased by the necessary factor to account for the initial vaporisation rate and the configuration of the hazard. The determination of the system design shall depend on an analysis specific to the individual site, since time to initiate actuation is a crucial factor in fire control. The analysis shall consider effects of heat exposure on adjacent plant equipment.

TEST DATA

Over the years extensive test work has been carried out to prove the effectiveness of high expansion foam for LNG vapour dispersion and LNG fire control, but limited test work on LPG. The majority of these tests have shown that foam of expansion ratio 500:1 (large bubbles produced by adding 500 parts of air to each part of foam solution), appears to be superior to both higher and lower expansion ratios for vapour dispersion as well as fire control purposes. Accordingly the vast majority (over 100) of operators for LNG liquefaction facilities, peak shaving plants and LNG import terminals around the world are using high expansion foam systems of 500:1 expansion ratio. Some tests have used foam of expansion between 150–300:1 for fire control, which has shown an increased penetration range into the fire. However, foam solution consumption rates can increase adding cost and it may be slower to flow across the spillage. Having said this 300:1 is a more popular expansion ratio for the fire control of LPG, which is not stored at such low temperatures.

The application rates used in these high expansion foam tests vary dramatically and produce widely varying reductions in fire intensity, varying speeds for a reduction in heat flux to occur, and varying effectiveness of the foam blanket to maintain control over time.

Consequently the rates may vary significantly from one manufacturers foam concentrate and foam generating equipment to another, since a wide range of factors will affect the foams performance.

Factors affecting the overall effectiveness of any high expansion foam system are complex and interrelated. They include the:

- Size of LNG or LPG spillage
- Application rate
- Expansion ratio
- Foam concentrate (formulations vary and can produce widely varying performances)
- Foam induction rate (accurate proportioning is crucial to consistent foam production)
- Foam generator (different technologies will produce widely varying foam quantities)
- Foam bubble stability (size, uniformity and ability to retain water)
- Depth of foam blanket
- Speed of system operation
- Prevailing weather conditions

Factors of safety should also be taken into account by the fire protection system designer or 'Authority having jurisdiction' over the specific installation. Extreme care should therefore be taken when choosing the most suitable high expansion foam system for these complex applications.

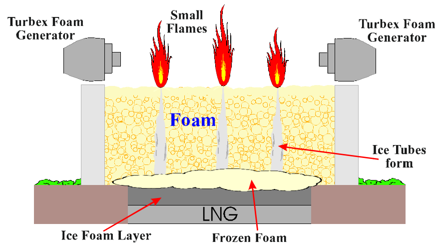
HOW DOES THE FOAM WORK?

Fire Control

The gas produced by vaporising LNG under accidental release conditions is at a temperature close to that of the LNG itself (–164°C). Vapours boiling-off are heavier than air and form a cold vapour cloud hanging above the spillage. Unless immediate action is taken, air movements will begin spreading this cloud horizontally in all directions from the spill until it is sufficiently diluted with air to become flammable. Then, somewhere at the edge, where the LNG vapour is well mixed with air, forming a 5–14% gas concentration, it will find a source of ignition, ignite and burn back to the liquid pool.

If the LNG vapours do ignite, a major problem exists in addition to the vapour cloud – that of severe radiated heat. The degree of severity depends on how far away the fire is from surrounding buildings, plant and personnel on site, as well as the prevailing environmental conditions at this time. However, buildings a considerable distance from the fire will be at risk, even during still air conditions and any wind will dramatically increase the radiated heat in the downwind direction, so protective action must be taken.

The mechanism for fire control using high expansion foam is quite complex. Essentially a foam blanket is rapidly produced to reduce the rate of heat



transfer from the fire to the liquid LNG pool, slowing the initial boil off rate down to a steady state situation.

Expansion ratios of 500:1 (when produced from a high quality foam concentrate) appear to be optimum for minimising the time required to gain control of an LNG spill fire.

Despite the intense radiant heat from the burning LNG pool, the 500:1 foam blanket quickly freezes at the foam-LNG interface, but this ice layer is light enough to float upon the LNG surface and also strong enough to support several feet of foam build up, without breaking or sinking. Near this interface ice tubes also begin forming where the escaping cryogenic vapours are boiling through the foam blanket. Rapid foam application dramatically reduces radiation flux levels, until the flames burn back the foam bubbles, when further foam is applied. Ongoing fire control is

achieved by periods of topping-up after each burn back. Repeated applications of foam are continued until the LNG pool has completely boiled away, vapour levels return to normal and the incident can be declared over.

High expansion foam has a similar effect on LPG adding heat and increasing the rate of vaporisation. 70% heat flux reductions can be achieved by controlled burn off. Moisture, air and flammable vapours premix in the foam blanket causing increased combustion efficiency thereby producing a cleaner flame of shorter length. To achieve this the foam used should have a quarter drainage time in excess of 15 minutes for optimum stability. As with LNG, foam at the interface forms a low density frozen crust on the surface of the liquid. However, it is particularly important with LPG to avoid total extinction, otherwise the heavier-than-air vapour will flow outwards under the foam blanket and build up as a vapour cloud in hollows or basements with a risk of toxicity to personnel, sudden reignition or explosion.

Water spray systems located around the risk area may assist with the turbulent dispersal of the heavier than air vapours by mixing with air and diluting the gas cloud to below flammable levels.

Sonatrach the world's largest exporter of LNG with storage tanks protected by Angus Fire LNG Fixed Turbex High Expansion Systems at their Arzew complex in Algeria. *Pic courtesy of MW Kellogg Company*

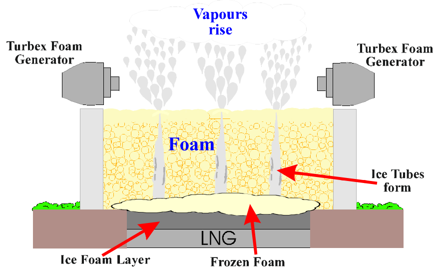
Increasingly LNG operators are also opting to maintain fire control with foam rather than completely extinguish the fire with dry chemical powder. This avoids the risk of flammable vapour levels drifting or accumulating downwind then reigniting, causing increased danger to personnel and plant alike.

When a high degree of exposure protection is required for controlling large LNG spill fires, these high expansion foam systems can offer major cost savings over conventional water spray exposure protection systems. Such water curtain systems are far less efficient at reducing radiation heat flux than results obtained with high expansion foam systems, even though considerably higher water flow rates and supply pressures need to be used. This is especially significant on a first

installed cost basis, since greatly reduced water flow rates and pumping capacities are required by high expansion foam systems. Operating costs would be higher for foam systems, but their anticipated usage should be severely limited and their effectiveness would be superior if needed!

Vapour Dispersion

Not all accidental spillages of LNG ignite in the early stages of release. Some operators recognise that the configuration of their particular plant would mean a catastrophic failure if ignition took place, with the complete destruction of the facility however



quickly action was taken. In these instances high expansion foam systems can also be highly effective in dispersing the LNG vapours upwards and away from the potential ignition sources.

It is to minimise the risk of vapour ignition that such systems are required to take immediate action by covering the bunded areas around these LNG storage tanks with foam bubbles of uniform 500:1 expansion ratio.

This foam covers the surface of the cryogenic liquid providing sufficient water content to warm the LNG vapours as they rise through the foam layer. This buoyancy effect will reduce the downwind travel of flammable concentrations near ground level and assist dispersion of the LNG vapours to higher and safer levels in the atmosphere.

High expansion foam will not disperse vapours of LPG, as they are always heavier than air. Controlled ignition of LPG vapours under a high expansion foam blanket (300–500:1) represents an effective way to burn off the LPG under controlled conditions.

LATEST DEVELOPMENTS

Angus Fire are recognised as world leaders in LNG/LPG protection. Their specialised Fixed Turbex high expansion foam systems are specifically designed for these cryogenic applications using Expandol foam concentrate which are in use at many LNG and LPG facilities around the world including Australia, Indonesia, Algeria, Qatar, UK etc. Amongst the largest has been a £3 million upgrade contract for the supply of high performance LNG Fixed Turbex Systems to Algeria's state owned oil and gas company Sonatrach. Probably the world's leading exporter of LNG, Sonatrach installed this system as part of the modernisation and expansion programme at its liquefaction plants in Arzew/Bethioua. The system fully complies with both NFPA 11A and the detailed technical specification issued by the M W Kellogg Company of Houston, Texas, who were the chosen engineering contractor appointed by Sonatrach to upgrade their facilities.

For a high expansion foam system to be effective the 500:1 generators must be located at the edge of the bund (dike) wall or edge of the containment/pump pit, so that any LNG spillage can be quickly covered with foam. Such generators cannot be located remotely from the bund because of the potential foam transit time delay. This could reduce the effective lifetime of the foam on the LNG spillage, and encourage water draining from the foam to enter the LNG pool and cause increased boil-off rates. A similar situation arises for LPG although a new 300:1 LPG Fixed Turbex has been

developed specifically to meet this differing requirement.

Even if the LNG spill has not ignited, the risk of ignition is ever present. The severe radiant heat rapidly generated if ignition takes place, means that standard industrial high expansion foam generators are totally unacceptable for these specialised cryogenic applications. Standard industrial units usually include mild steel, aluminium or plastic based components which deform or melt with the radiant heat levels experienced, preventing effective operation and foam production.

Experience has shown that simple air-aspirating or 'spray on net' generators are easily starved of air by light wind movements and up draught effects blowing across the inlet, significantly changing the amount of air being drawn into the unit from one minute to the next. This variability on airflow when the foam solution flow is constant can have a major impact on the expansion ratio of the foam bubble blanket, producing very variable and far less efficient foam.

To overcome these inherent problems forced air technology is required using a water driven turbine and special aerofoil fan to provide a consistent airflow through the LNG high expansion foam generators to maintain expansion ratio, without resorting to any electrical power source which could also cause ignition of the vapour. This minimises the bad effects of wind and up draughts. The revolutionary cocoon-shaped design of the Fixed Turbex ensures a stable slow-draining foam blanket and uniform bubble size for optimal performance, resulting in a far more reliable, efficient and uniform foam expansion, a major benefit over the simpler air aspirating units.

Clearly to withstand the potential radiation heat flux of an LNG spill igniting, special considerations must be made in designing and producing a suitable turbex foam generator. The onerous fire exposure test requirement laid down in NFPA 11A must be passed by any generator for LNG applications. This requires exposure to direct flame impingement for 5 minutes over burning n-Heptane and the generator must then work satisfactorily. This fire intensity is designed to mimic the high radiation levels generated by LNG. During the development of the latest LNG Fixed Turbex Generators, special attention was given to these factors by Angus Fire. As a result a significantly

Stainless Steel ducting directs Expandol foam into bund where it resists wind disturbance.

upgraded 316 stainless steel and gunmetal high performance 500:1 unit passed this NFPA 11A fire exposure test by withstanding internal temperatures of 1000°C before then operating perfectly. The LPG 300:1 unit has been designed to withstand the same onerous conditions.

Clearly a fast acting foam proportioning system is also needed to mix Expandol foam concentrate into the water supply which can often mean a complex system of foam skids and remote induction, also designed and manufactured by Angus Fire.

WHICH FOAM?

The choice of foam concentrate is also an important factor in optimising foam stability and expansion ratio, to gain maximum effectiveness, whether for LNG/LPG fire control or LNG vapour dispersion systems. Lower quality concentrates usually exhibit less stability as indicated by their relatively faster drainage times (the time taken for 25% of the water contained within a known weight of foam bubbles to drain out). When the foam is more fluid with less uniform bubble production, its effectiveness at fire control and reducing vapour concentrations above the foam blanket are significantly impaired. Increased frequency of 'topping up' will also be required.

Many companies manufacture high expansion foams but the high quality concentrates like Expandol, exhibit greater stability, and when produced with a uniform bubble size maintain a significantly more stable foam layer. The vapours are therefore warmed and dispersed more efficiently by this higher quality foam and Fixed Turbex generating system. Such foam stability helps to reduce the required foam top up rate to a minimum, thereby maintaining effective control of fire or vapour dispersion with minimal foam concentrate usage. This can also help reduce the rate of ice build up at the LNG/LPG interface.

CONCLUSIONS

This is a complex and quickly changing hazard to protect, with the ever-present risk of a major explosion.

High expansion foam systems are the most credible and preferred solution to reducing the fire intensity with LNG/LPG hazards and the vapour dispersion risks associated with LNG. Knowledge and test work in this area is limited, further work is hampered by the extremely hazardous nature of both LNG and LPG, the obvious reluctance from a safety standpoint in carrying out test work and the costs involved in monitoring any test spillages.

In addition to (and partly because of) these factors the amount of LPG and LNG expertise around the world is concentrated within a few organisations who have made a substantial commitment to understanding these problems and investigating ways to overcome them with effective solutions. Angus Fire and MW Kellogg are leaders who are pleased to be involved at the forefront of this specialised fire fighting technology.

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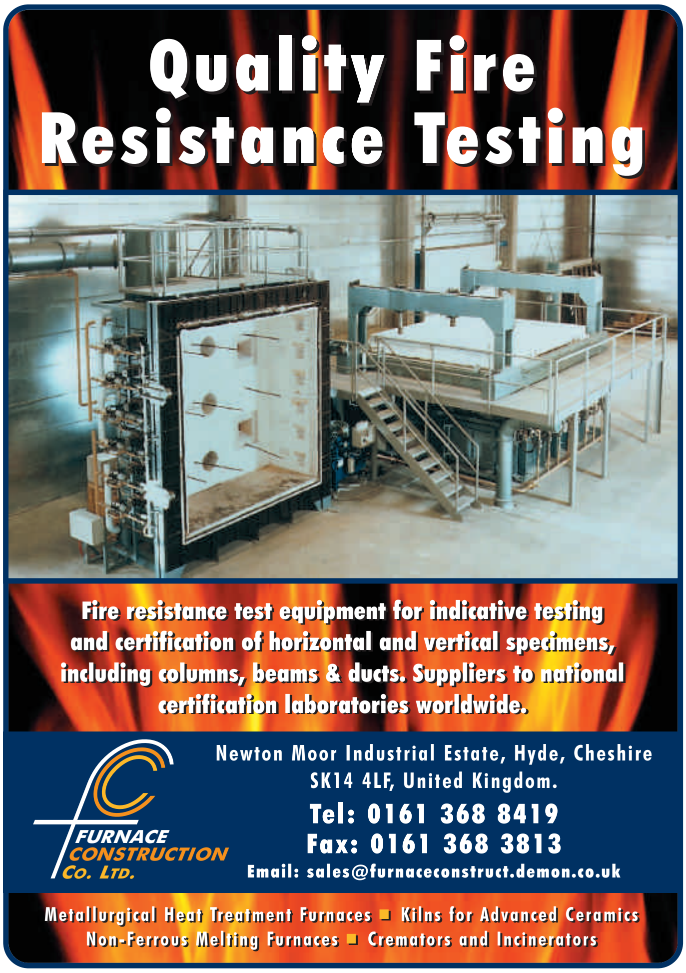

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Voice Messaging for Gas Systems

By Vivian Jones

Pic courtesy of Vimpex Ltd

THE FIRE-CRYER® FAMILY OF VOICE ENHANCED SOUNDERS can broadcast 4 messages using just 2 wires. Now this unique feature provides fixed gas extinguishing systems with low cost voice alarm messaging solutions. Vivian Jones, Managing Director of Vimpex Ltd, outlines its application in gas systems.

New developments in voice enhanced sounders, mean gas suppression systems no longer have to rely on two separate sounders to alert occupants of impending gas release. There are now multi-message voice enhanced sounders available with special gas messages to broadcast 1st, 2nd and 3rd stage gas alerts with 'All Clear'. Confusion over signals can have fatal implications in gas systems and voice sounder messaging is a simple low cost solution to overcome this problem.

Vimpex have developed one of the largest voice sounder families currently available and have helped to develop the application of voice enhanced sounders into the mature market of today.

Whilst conceived as a simple replacement for existing sounders, the current generation of voice sounders can broadcast up to four separate messages on just two wires, enabling the retrofitting of Fire-Cryer® onto the existing conventional sounder circuits.

Vimpex believes that use of voice-enhanced sounders mitigates the potential confusion of the public on hearing an alarm. The thought – 'what's that mean?' – is avoided with

Pic courtesy of Vimpex Ltd

the simple unambiguous message 'Fire, Fire. Please leave the building'. It leaves no-one in any doubt as to the meaning of the alarm. In general, the voice message is preceded by an attention-seeking signal.

Many thousands of voice sounders have been installed mostly in larger systems than originally envisaged. But can they reduce unwanted false alarms? It is surprising how many times this question has been asked. The answer becomes quickly evident when it is realised that additional messages can be added to a voice sounder without the need for extra cabling, and this provides a tangible contribution in, at least, mitigating the cost and disturbance associated with nuisance alarms.

Tempting as it might be to produce the message 'Please ignore this alarm – it is yet another false one', a multi-message voice sounder can be switched quickly (after establishing the status of the alarm) to 'All Clear, All Clear, no further action required' – if that is the case. Message switching is achieved by a bespoke Voice Message Controller (VMC) or by interfacing the PCB adjacent to or within the fire panel.

The message 'This is a 'Fire Test, no action required', used immediately prior to the regular testing of the alarm,

Pic courtesy of Vimpex Ltd

followed by 'All Clear' provides real communication with office staff, warehouse workers, hotel guests, university students, travellers, clubbers and shoppers and the like. These voice sounders have been installed in many diverse projects and there seems no limit to the demand for special messages to suit specific project requirements.

Special messages which may be supplied via the Internet as an attachment in *.WAV file format. CD-ROM or tape format is also acceptable but common ground rules should be followed. Principally it is advised that the message should be short and precise, spoken with clear diction and even voice level. Standard library messages, which now run into hundreds, were recorded in a professional studio.

In many cases, providing agreement has been reached with the specifying authorities, it may be desirable to confirm the status of an alarm before evacuation. Whether it is a system plagued by malicious alarms or persistent false alarms, the voice sounder can first transmit a coded staff signal and simultaneously start a timing sequence. This 'time out' phase can be selected at installation or later enacted if found to be necessary.

When the fire signal is received from the fire alarm panel, the default fire evacuation message is substituted by a coded staff message and this will be continuously transmitted for a period selectable between 30 seconds and 8 minutes. This allows the fire warden or other responsible person to investigate the cause of the alarm. If the pre-selected phase 'times out' the system will be immediately over-ridden by a second alarm call or manually by the fire warden.

Gaseous extinguishing systems application

The most recent development for voice sounders is for use with gaseous extinguishing systems. This follows the development of the software to enable compatibility with the functions of gaseous extinguishing systems.

Historically, the first stage of the 'double knock' triggering approach used in an extinguishing system was signalled by a particular sounder or bell. This alert tone would continue until either reset or a second, i.e. 'double knock', signal was

Typical Voice Sounder Messages for Gaseous Extinguishing Systems

- Halon gas release imminent. Vacate area immediately.
- Carbon dioxide gas release imminent. Vacate area immediately.
- Extinguishant gas release imminent. Vacate area immediately.
- Extinguishant gas release imminent. Please evacuate the area.
- Extinguishant gas system discharged.
- Extinguishant gas discharged. Do not enter.
- Toxic gas has been discharged. Evacuate the area immediately.
- Please evacuate the area. Toxic gas released. Toxic gas released.
- Excessive carbon monoxide levels have been detected. Please leave the area immediately.
- Attention! Attention! Gas detected. Please evacuate the area.
- First stage extinguishant release warning.
- Second stage extinguishant release warning.
- Extinguishant release imminent.
- Extinguishant released.
- Please leave the room immediately; gas release imminent.
- Please leave the room and close the door.
- Gas release in 10 seconds.
- Please leave the room and close the door immediately.
- Gas release in 5 seconds.
- Gas released; do not open the door unless absolutely necessary.
- Gas released.
- Inergen gas discharge imminent. Please evacuate the area.
- Inergen gas system has been discharged
- Inergen gas discharged. Do not enter.
- FM 200 gas discharge imminent. Please evacuate the area.
- FM 200 gas system has been discharged.
- FM 200 gas discharged. Do not enter.
- Argonite gas discharge imminent. Please evacuate the area.
- Argonite gas system has been discharged
- Argonite gas discharged. Do not enter
- FE-36 gas discharge imminent. Please evacuate the area.
- FE-36 gas system has been discharged.
- FE-36 gas discharged. Do not enter.
- Pyrogen extinguishant gas release imminent. Vacate area immediately.
- Pyrogen extinguishant gas release imminent. Please evacuate the area.
- Pyrogen extinguishant gas system discharged.
- Pyrogen extinguishant gas discharged. Do not enter.

initiated. This would introduce a second sound with a different tone, either continuous or pulsing, for stages two and three. This could be very confusing, even though everyone within the protected area should be trained and aware of the procedures.

It is now possible to avoid any potential confusion by introducing the voice sounder, whether in a new system or retrofitted. The messages explain exactly what is happening, for example:

First stage – 'Gas release warning, please evacuate'
Second stage – 'Gas release imminent, evacuate now'
Third stage – 'Gas released do not enter'
and, finally – 'All clear, no further action required'

It is possible to offer countdown in real time but over-ride functions can be configured and are included as standard.

This is a new and vitally important step as lives may be at risk especially where CO_2 is installed.

It is now possible to include strobes together with voice sounders on the same circuit with the strobes being activated only in the evacuation mode. Additionally it is possible to activate a different coloured strobe in conjunction with an alert message. Activation is automatically prevented in the 'All Clear' or 'Fire Test' modes.

Voice Sounders can also have a strobe module, that can be used to flash different coloured strobes at different stages of the extinguishing sequence, i.e. the first stage being the alert (amber), the second and third stages danger (red).

Enquiries: www.rectorseal.com

Enquiries: info@cafcointl.com

Fire Boards: *Influential and Protective!*

By Graham Ellicott, Chief Executive, Association for Specialist Fire Protection (ASFP)

Pic courtesy of ASFP

WHAT DO YOU THINK OF FIRST when you hear the phrase fire board, is it the foil faced stone wool product, a golden flaked vermiculite silicate slab, fire resistant plasterboard (drywall if you're exercising the gray matter in North America) or the relentless greyness of calcium silicate? Or do you think outside of the box and see a number of influential people sitting around a table?

Personally, my thoughts on fire boards vary depending upon the situation and/or problem at hand. For instance what board over the last couple of years has had a significant influence over the level of fire safety in the UK's buildings? My first inclination in answer to this question is to say the Fire Safety Advisory Board.

During 2000 the UK's Central Fire Brigades Advisory Council (CFBAC) created the Fire Safety Advisory Board (FSAB) which has since become the national forum for the consideration of fire safety matters. The FSAB provides a meeting place for bringing together representatives from Central and Local Government with those representing professional associations and business organisations. The remit of the FSAB is to allow the development of a truly national strategy for ensuring the fire safety of society. Under the independent chairmanship of Pamela Castle the FSAB has proved to be an effective and influential body and has looked at issues such as fire safety legislation, community fire safety, fire safety standards and guidance, and the costs of fires.

CFBAC is to be congratulated for its forward thinking in the creation of the FSAB. However, a cloud hangs over the future of the FSAB and that particular cumulus is the 'Report of the Independent Review of the Fire Service' (also known as the Bain Review). The Bain Review's proposals for future fire safety policy do not seem to allow for any future advisory board to have any input from industry (via trade associations or the like) and in my opinion this will be detrimental to the fire safety of the UK public and its buildings. It is to be hoped that the current powers responsible for determining the future of the UK's fire safety policy are as forward looking as their predecessors and that they will allow the FSAB to continue to carry out its valuable work.

But, I hear you say, enough of the FSA 'Board'. What about the board products that are used for the passive fire protection of structures? Well, essentially boards are used for two main types of fire protection. Firstly, to provide enhanced fire resistance to the building structure and secondly, as part of compartmentation systems.

All common construction materials have some natural resistance to fire. Concrete is prone to spalling if exposed to a high degree of thermal shock, due to the residual trapped water boiling and turning to steam, which can cause cracking and explosive spalling in a fire situation. Steel will hold the design load up to temperature of 550/580°C, but will then soften. Lower loads than the stipulated maximum will allow higher failure temperatures, but the periods of time required for building stability require insulation to be applied to hold back the 'point of plasticity'. Timber burns or chars at a known rate. This is equivalent to 20mm in 30 minutes. It will ignite at 350°C and the performance is quite predictable.

It is the function of passive fire protection to provide insulation to these materials so as to enhance their fire performance. This applies mainly to steel, but concrete and timber can also be treated to enhance their fire performance.

The original steel frames were fire protected by casting them in concrete. Cost was a major problem and the growth of the passive fire protection industry started when alternative methods of protecting steel became available. These methods enabled the steel fabricators to compete with concrete as a framing medium, thus the share of the framing market enjoyed by steel increased. In the mid 70's steel was used for around 30% of buildings, this is now increased to over 70%.

For compartmentation the England and Wales Building Regulations state that it should:

Pic courtesy of ASFP

- Subdivide buildings into areas of manageable risk
- Provide adequate means of escape
- Provide fire separation between adjacent/adjoining buildings.

The space separating elements such as fire board systems are tested for:

- Stability
- Integrity
- Insulation.

But it is not just sufficient to install a fire resistive fire board compartmentation system as it will often need to be breached so that services such as pipes and cable trays may pass thorough. Such breaches need to be properly sealed after the services have been installed; otherwise the compartmentation system will be severely flawed.

The actual words in the Building Regulations, Approved Document B, section 11.2 say: "If a fire separating element is to be effective, then every joint, or imperfection of fit, or opening to allow services to pass through the element, should be adequately protected by sealing or fire stopping so that the fire resistance of the element is not impaired".

Under the heading of 'Fire-stopping', section 11.12 adds a requirement that:

Joints between fire separating elements should be fire stopped; and all openings for pipes, ducts, conduits or cables to pass through any part of a fire separating element should be:

- kept as few in number as possible and
- kept as small as practical
- fire-stopped (which in the case of a pipe or duct, should allow for thermal movement).

A major threat occurs in many buildings, where concealed cavities between fire separating elements are interlinked. It is therefore essential that all openings and gaps are fire-stopped to restrict lateral and vertical fire spread and achieve the required level of containment.

In practice, penetration seals will be attached to fixed elements of a structure such as walls or floors. The effects of expansion, contraction and deflection of these elements will also need to be considered, in order to fully evaluate the fire performance of the penetration seal. The majority of lightweight barrier constructions tend to bow towards the fire, as the side exposed to the fire expands more than the unexposed face. Adequate provision needs to be made for the relative movement of the barrier to the penetration seal, in order to maintain integrity for the required period.

Fire boards for structural or compartmentation use can be made up of anything from gypsum-based plasters or calcium silicate, through fibres and specialist vermiculite containing materials. 'Soft boards' are sometimes fixed, with special corkscrew like screws, or by impaling onto proprietary clips.

In general, these boards protect the structure in the event of a fire via the 'cooling' effect of any residual water; once this has all boiled away the board acts as an insulator.

Services can obviously be fitted behind the boards and it also follows that whenever these services are maintained the fire protection has to be removed to gain access to them. Afterwards the passive fire protection will need to be refitted in line with the official requirements. The boards are often untreated when not in public view, but can be decorated for aesthetic reasons.

It is strongly recommended that fire board systems and indeed any passive fire protection system be installed by a third party accredited applicator.

Once installed what should the client look for to make sure that the job has been carried out correctly? Firstly, he or she should request a copy of the fire protection installer's working drawings. These show the type and thickness required of structural fire protection and type of compartmentation/penetration system. If they are not available ask the installer to provide copies; if he is unable to provide them, then the inspector should ask why not? Does the firm intend to install the same rating of product everywhere? If drawings are available check the type of fire protection and see if this agrees with the manufacturer's literature and does it fulfil the needs of Approved Document B of the Building Regulations. If there is any doubt, and on any large job, call in the manufacturer's representatives and get their views on the appropriateness of the proposed installation.

> *It is strongly recommended that fire board systems and indeed any passive fire protection system be installed by a third party accredited applicator.*

In particular board systems for structural steel may have different fixing systems for different ratings and the inspector should make sure that the appropriate one is being used. It should be ensured that all fixings are installed at the appropriate centres and if noggins are required the inspector should determine if they need adhesive, or if friction fitting is sufficient.

Board systems for compartmentation should be inspected to ensure that appropriate framing system has been correctly installed and that any service penetrations have been properly sealed.

My final thought on fire boards is that those containing people should be properly constituted and led and that fire board products be correctly installed. If this happens, then the UK should be a safer place with regard to fire.

Novec™1230

Liquid Technology

Zero ozone depleting
fire protection
from Hygood

- Zero ozone depleting potential
- Atmospheric lifetime of less than 5 days
- Insignificant global warming potential
- Safe for occupied areas
- Replaces existing halon systems
- Requires minimal storage space
- Tests and Listings under way

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Enquiries: www.macron-safety.com

Recent Developments in Clean Agents and Clean Agent Systems

By Mark L. Robin and Jason Ouellette,
Hughes Associates, Inc.

Pic courtesy of Hughes & Associates, Inc.

SINCE THE TIME OF OUR REVIEW OF LAST YEAR (*International Fire Protection Magazine*, May 2002) a number of new developments have occurred which impact the clean agent marketplace. These recent developments include the continuing decommissioning of Halon 1301 systems worldwide, the introduction of new clean agents, the withdrawal of several clean agents from the marketplace, the introduction of new suppression system designs, and a number of proposed changes to the national and international standards governing the use of clean agent fire suppression systems.

HALON OUT...CLEAN AGENTS IN

For over 30 years Halon 1301 has served as a nearly ideal fire suppression agent. However, due to its implication in the destruction of stratospheric ozone, the Montreal Protocol of 1987 identified Halon 1301 as one of numerous compounds requiring limitations of use and production, and an amendment to the original Protocol resulted in the halting of Halon 1301 production on January 1, 1994.

Today the installation of Halon 1301 suppression systems is a rare occurrence, limited to specifically defined "essential" uses, primarily within the aviation and military sectors. In most cases these systems employ reclaimed and recycled Halon 1301 due to the ban on the production of new Halon 1301.

In addition to the almost worldwide production ban on Halon 1301, numerous countries have taken steps to mandate the removal of Halon 1301 suppression systems. The complete removal of Halon 1301 systems, with the exception of a small number of systems involving essential use applications, has already been accomplished in Germany and Australia. Canada has implemented a Halon 1301 phase out plan, whereby starting in 2010 no refills of fixed Halon systems will be allowed.

The current and future use of Halon 1301 within the European Community is governed by EC Regulation 2037/2000. Critical uses for Halon 1301 which will be permitted include aircraft applications (crew compartments, engine nacelles, cargo and dry bays), military applications (engine compartments and occupied spaces in vehicles and vessels), and specialized inerting applications (Channel Tunnel, facilities processing radioactive materials, communication and command centers essential for national security).

EC Regulation 2037/2000 also sets the dates for the decommissioning of non-critical Halon 1301 systems. The sale and servicing of halon systems with virgin halon within the EC has been banned since 1 October 2000. All Halon 1301 units not listed as critical must be decommissioned by 31 December 2003.

With the growing demise of Halon 1301, the need for alternative systems

Pic courtesy of Hughes & Associates, Inc.

Recent Developments in Clean Agents and Clean Agent Systems

is growing, and it is expected that a large portion of this market will be satisfied through the use of the clean agents.

NEW KIDS ON THE BLOCK

In response to the ban on Halon 1301 manufacture, the fire suppression industry has developed a number of environmentally-friendly alternative clean agents for total flooding applications. In the past year, two new agents have been introduced to the clean agent marketplace, NAF S 125® and Novec™ 1230.

NAF S 125® is the trade name for a mixture of pentafluoroethane with D-limonene, marketed by Safety Hi-Tech Services (SHT), a division of Safety Hi-Tech Srl. Pentafluoroethane is a hydrofluorocarbon (HFC), commonly designated as HFC-125. D-limonene is a naturally occurring substance, also known by the chemical name 4-isopropenyl-1-methylcyclohexene, and is the main component of citrus peel oil. The presence of D-limonene in the extinguishing mixture serves to reduce the amount of acidic compounds (hydrofluoric acid) formed during fire

Table 1. Commercially Available Clean Agents

Tradename	Manufacturer	Chemical Formula	Contact Information
FM-200	Great Lakes Chemical	CF_3CHFCF_3	www.fm-200.com
FE-227	Du Pont	CF_3CHFCF_3	www.dupont.com/fire
FE-125	Du Pont	CF_3CF2H	www.dupont.com/fire
FE-13	Du Pont	CF_3H	www.dupont.com/fire
FE-36	Du Pont	$CF_3CH_2CF_3$	www.dupont.com/fire
Triodide	Ajay North America	CF_3I	www.CF3I.com
NAF S 125	Safety Hi-Tech, Srl	CF_3CF_2H 0.1% D-limonene	www.safetyhitech.com
NAF S III	Safety Hi-Tech	4.75% CF_3CHCl_2 82% CF_2HCl 9.5% CF_3CHFCl 3.75% D-limonene	www.safetyhitech.com
Novec 1230	3M	$CF_3CF_2C(O)CF(CF_3)_2$	www.3m.com
Argotec	Minimax GmbH	Ar	www.minimax.com
N100	Koatsu	N_2	www.koatsu.co.jp
Argonite	Ginge-Kerr	50% N_2 50% Ar	www.ginge-kerr.com
Inergen	Ansul	52% N_2 40% Ar 8% CO_2	www.ansul.com

suppression from the decomposition of the HFC-125 component. NAF S 125™ systems are currently being marketed in both low pressure (360 psig superpressurization with nitrogen) and high pressure (600 psig superpressurization with nitrogen) versions. The ozone depletion potential (ODP) of NAF S 125® is a zero, and its global warming potential (GWP) is 3400 (for a 100 year time horizon).

Novec™ 1230 is the trade name for the fluorinated ketone1,1,1,2,2,4, 5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone, marketed by 3M. Chemically, Novec™ 1230 belongs to the class of perfluorinated ketones, or totally fluorinated ketones. As a member of the ketone family, the Novec™ 1230 molecule contains a carbonyl (C=O) group within its molecular structure. The presence of this particular "functional group" as it is referred to by chemists, imparts two properties to the Novec 1230™ molecule which are absent in the hydrofluorocarbon (HFC) type agents: chemical and photolytic (light) reactivity. Due to its photolytic reactivity, Novec™ 1230 is rapidly removed from the troposphere via photolysis, i.e., Novec™ 1230 is rapidly decomposed by interaction with the ultraviolet radiation from the sun. As a result, the atmospheric lifetime and GWP of the agent are low: 3M has reported an atmospheric lifetime of approximately five days, and a GWP of 1. Novec™ 1230 contains no bromine or chlorine, and hence it has an ODP of zero.

A total of three clean agents have been voluntarily removed from the marketplace by their manufacturers within the last year. At the recent meeting of the ISO TC/21/SC 8 subcommittee in New Orleans in September 2002, the subcommittee agreed to eliminate the agents octafluoropropane

Pic courtesy of Ginge-Kerr Danmark A/S

Introducing 3M™ Novec™ 1230 Fire Protection Fluid—the new standard for halon replacement. Protect what matters most with Novec 1230 fluid. It's the long-term, sustainable clean agent that has the greatest margin of safety of halon replacements. Ideal for use in occupied spaces, it protects high-value assets, has zero ozone depletion potential, a global warming potential of one and a five-day atmospheric lifetime. Novec 1230 fluid not only meets today's regulations but those of the foreseeable future. It is easy to handle and store, and is available for use in streaming and flooding applications. To view or download product information, visit our Web site at www.3m.com/novec1230fluid. Or call 800-632-2304 in the U.S. or 32 3 250 7874 in Europe. Created for life.

98-0212-2616-6

3M *Innovation*

Enquiries: www.3m.com/novec1230fluid

Recent Developments in Clean Agents and Clean Agent Systems

($CF_3CF_2CF_3$, FC-2-1-8, 3M), n-decafluorobutane ($CF_3CF_2CF_2CF_3$, FC-3-1-10, 3M), and chloro-tetrafluoroethane (CF_3CHFCl, HCFC-124, Du Pont) from the ISO 14520 standard.

Table 1 lists the clean agent fire extinguishants which are currently commercially available. The clean agent marketplace is currently dominated by two agents: FM-200® and Inergen®; FM-200® has an estimated 100,000 installations in more than 70 countries worldwide. Clean agents are employed in a myriad of applications, including pleasure boats, marine and military vessels, flight simulators, medical facilities, cellular sites, internet service provider (ISP) centers, TV and radio control rooms, microwave relay towers, anechoic rest chambers, clean rooms, flammable liquid storage areas, art galleries, libraries and museums. Worldwide, numerous high value items are protected by clean agent systems. FM-200® suppression systems protect the electrical systems of the Eiffel Tower, the first draft of the Declaration of Independence, and protected the Star Spangled Banner during its recent restoration. FE-125 suppression systems protect the engine nacelles of the U.S. Navy F/A-18E/C and V-22 aircraft. FE-13 systems are employed in inerting applications on the North slope, and Inergen® systems protect a copy of the Gettysburg address.

NEW CLEAN AGENT SYSTEM DESIGNS

In addition to the introduction of new agents, the past year has also seen the introduction of new suppression system designs into the clean agent marketplace.

Kidde-Fenwal has recently introduced its Advanced Delivery System (ADS), which employs FM-200® as the fire suppression agent. The ADS system utilizes a "piston-flow" design in which nitrogen gas is used to "push" liquid FM-200® through a pipe network. Nitrogen and FM-200® are stored in separate cylinders, connected through the appropriate hoses and control hardware. Upon activation of the system, nitrogen flows into the headspace of the FM-200 cylinder, "pushing" the FM-200® through the cylinder dip tube and through the system piping network.

The ADS system offers several advantages compared to "traditional" FM-200® systems, which employ liquid FM-200® superpressurized with nitrogen

Pic courtesy of Ginge-Kerr Danmark A/S

Ginge-Kerr Danmark A/S

Argonite® Fire Extinguishing System

Halon phase out - EC regulation 2037/2000 prohibits use of halons.

Since the early 90'ties Ginge-Kerr Danmark has developed Argonite systems available as 150 bar and 200 bar. In 2000 we launched the 300 bar Argonite system, based on a new valve concept which comply with the Pressure Equipment Directory (PED) and the Transport Pressure Equipment Directory (TPED).

The Argonite system is an environmentally friendly alternative to Halon, tested and approved by regulatory bodies throughout the world.

Argonite, inert gas systems

- Fast acting and effective against all fire hazards
- Safe for occupied areas
- Environmental neutral - zero ODP, zero GWP and zero atmospheric life time
- No post-fire residues or damage to protected equipment
- Available throughout the world

Argonite fire extinguishing system is engineered for single room protection or central bank system for protection of as many room as required, hence Argonite may be transported +300 meters. Do not waste time - check your local distributor on www.ginge-kerr.com

Argonite a safe and environmental friendly choice.

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(i.e., nitrogen and FM-200® are in the same cylinder). The ADS system enables greatly improved mass flow rates to be obtained, and also results in higher sustained average cylinder pressures. This allows the use of longer and more complex pipe distributions, as well as the use of smaller diameter pipework. According to Kidde-Fenwal, the use of the ADS system allows pipe distances of up to three times the normal pipe length for an FM-200® system to be easily achieved. The ability to use smaller diameter piping and longer pipe runs is essential when retrofitting existing Halon 1301 systems, and the ADS systems can be an effective retrofit solution for existing Halon 1301 systems. The ADS systems are both UL listed and FM approved.

Fike Corporation has recently introduced its ECARO-25™ clean agent fire suppression systems in Europe as well as in the United States. "ECARO" stands for Extinguishing Clean Agent Retrofit Option, and the Fike ECARO-25™ systems employ Du Pont FE-25 fire extinguishing agent. The ECARO-25™ systems are also marketed as retrofit solutions for existing Halon 1301 systems. ECARO-25™ systems are FM approved.

The inert gas clean agent manufacturers have also introduced system changes within the past year, and both lower and higher pressure systems have entered into the clean agent marketplace. The use of lower pressure systems is aimed at the retrofit market to allow utilization of existing Halon 1301 pipework where appropriate. The use of higher pressure systems increases cylinder capacity and hence reduces cylinder storage requirements.

Table 2. Fire Test Data for Clean Agents: Extinguishing Concentrations, % v/v

Agent	Test Laboratory	Heptane Cup Burner	Heptane Pan Fire	Wood Crib Fire
FM-200/FE227	HAI	6.7	6.9	4.9
FE-125[a]	HAI	9.3	9.3	6.7
FE-13	HAI	12.6	12.3	10.5
FE-36	HAI	6.5	7.5	5.0
Triodide	HAI	3.5	3.5	3.5
NAF S 125[b]	VdS/HAE	9.2	8.7	7.5
NAF S III	HAE	10.0	9.9	6.0
Novec 1230	UL	NA	4.4	3.4
Argotec	VdS	39.2	33.7	30.7
N100	NMRI	33.6	33.6	30.0
Argonite	DIFT/FM	37.8	30.2	28.7
Inergen	UL	31.7	29.6	28.2

[a] 360 psig system; [b] 600 psig system; HAI = Hughes Associates, Inc.; HAE = Hughes Associates Europe; UL = Underwriters Laboratories; NMRI = National Maritime Research Institute of Japan; DIFT = Danish Institute of Fire Technology; FM = Factory Mutual

CLEAN AGENT STANDARDS

ISO 14520, *Gaseous Fire Extinguishing Systems: Physical Properties and System Design*, specifies requirements and gives recommendations for the design, installation, testing, maintenance and safety of clean agent systems. The standard is comprised of part 1 covering general requirements, and parts 2 through 15 covering agent-specific requirements. The current version of ISO 14520 is the first edition, published in August of 2000.

Recent developments related to ISO 14520 result from the recent meeting of the ISO TC/21/SC 8 subcommittee in New Orleans in September 2002, where a number of proposals were approved by the subcommittee.

The ISO TC/21/SC 8 subcommittee agreed to the addition of two new agents to the ISO 14520 standard: NAF S 125™ and Novec™ 1230, discussed above. Three agents were eliminated from the standard: FC-2-1-8, FC-3-1-10, and HCFC-124.

The subcommittee agreed to allow agent exposure limits for the HFC clean agents to be based upon the PBPK model. The PBPK (physiologically based pharmacokinetics) model represents an improvement over the cardiac sensitization NOAEL/LOAEL approach previously employed to set exposure limits. The end result of the acceptance of the PBPK model is an increase in the maximum design concentrations allowed for HFC clean agents in normally occupied enclosures. Under the current proposal, design concentrations up to the cardiac LOAEL level would be allowed in normally occupied areas.

The subcommittee also accepted new fire test data for the clean agents. Extinguishing concentrations were determined according to the current procedures described in ISO 14520-1, first edition, Annex C. The data were produced by third party laboratories, and will serve as the basis for agent design concentrations in future additions

The ability to use smaller diameter piping and longer pipe runs is essential when retrofitting existing Halon 1301 systems, and the ADS systems can be an effective retrofit solution for existing Halon 1301 systems.

of ISO 14520. Table 2 shows the new fire test data.

Additional changes to the ISO 14520 standard accepted by the subcommittee included the acceptance of a plastics sheet fire test. The test procedure is similar to the plastic sheet tests of UL 2166 and UL 2127 and will serve as one of the bases for the determination of Class A design concentrations under future ISO 14520 editions. The cup burner procedure described in Annex B of ISO 14520 has also been altered to eliminate the testing of heated fuels and to eliminate the determination of the cup burner extinguishing concentration at airflows other than 40L/minute.

NFPA 2001 Standard for Clean Agent Fire Extinguishing Systems, also specifies the minimum requirements for clean agent systems; the current version of NFPA 2001 is the 2000 Edition. Two items have recently been proposed for inclusion in future editions of the NFPA 2001 Standard.

The NFPA 2001 Technical Committee has accepted the addition of a new agent, Novec™ 1230, described above.

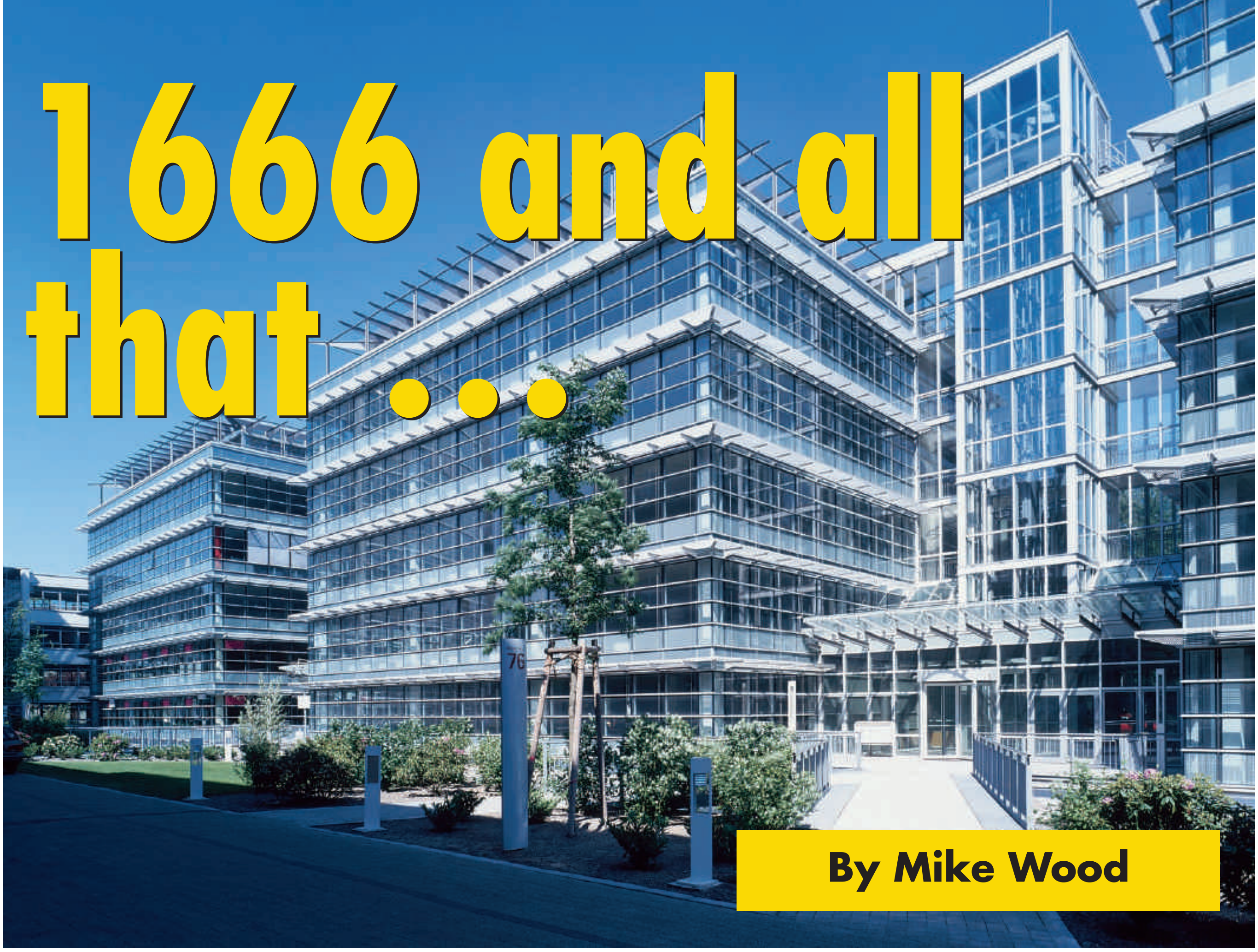
In addition, the NFPA 2001 Technical Committee has accepted a proposal to allow increases in the allowable design concentrations of HFC agents in normally occupied areas. Maximum allowable design concentrations would be based upon the results of PBPK calculations. Under the current proposal, design concentrations for HFC agents in normally occupied areas would be allowed to exceed the cardiac LOAEL level, as long as the design concentration is deemed safe for a 5 minute exposure by PBPK calculations.

CONCLUSION

The manufacturers of clean agents and clean agent systems continue to make available to the marketplace innovative suppression systems which avoid the environmental problems associated with Halon, through the introduction of both new agents and new system designs. Despite the ban and inevitable disappearance of Halon 1301, the availability of these clean agent systems ensures that businesses worldwide will continue to have the ability to protect critical equipment and assets. At the same time, the national and international standards governing the design and use of the clean agents are being constantly updated to ensure their inclusion of the latest technologies. As the mandated removal of Halon in the EC continues, and as the pressure to reduce dependency on ozone depleting substances increases worldwide, the clean agents will take on an increasingly important role in the solution of global environmental problems.

Mark L. Robin – author

1666 and all that...



By Mike Wood

Fire-resistant façade glazing with Pilkington Pyrostop™ for 90 minutes' insulation and integrity in an office building in Berlin

EARLY ON SUNDAY MORNING 2ND SEPTEMBER 1666, THOMAS FARYNOR, baker to His Majesty Charles II, had no inkling as he woke up that he would be responsible for one of the most significant events in the history of London, nor that hundreds of years later he would feature in an article on fire protection. The Great Fire of London started in Thomas' bakery in Pudding Lane and quickly spread from building to building across the whole City. Within 5 days the city had been substantially reduced to ashes: 13,200 houses and 87 churches destroyed, an area one and a half miles by half a mile totally levelled.

Should we still be mindful of the lessons of The Great Fire after all this time? Or, can we automatically assume that the principles are fully absorbed within modern fire safety building concepts and practice? The cause of the fire was essentially carelessness, but accidents do happen. The extent of destruction was basically down to the extreme ease with which fire could jump from building to building, plus the combustibility of building materials. Houses were crammed next to each other within the city walls; construction materials – timber, pitch and thatch – were readily set alight and not easily extinguished by the primitive hand operated pumps of the time. The smoke detection and alarm system of the time was based only on human and animal senses. An organised fire fighting service didn't exist; and there was no concept of community fire safety.

Within an integrated strategy for fire containment, it's easy to forget that it isn't only the measures taken within the building that count. As the occurrence of The Great Fire of London effectively illustrates, the prevention of fire spread from building to building is also fundamentally important. In this respect, building design, building materials, and town planning are important contributors to the mix of elements that go to make an effective fire protection strategy for built up areas. Ideally, we should isolate buildings with a good separation distance between neighbours, but that isn't always possible where street layouts are more frequently decided by history and expediency than by judicious planning with fire safety in mind.

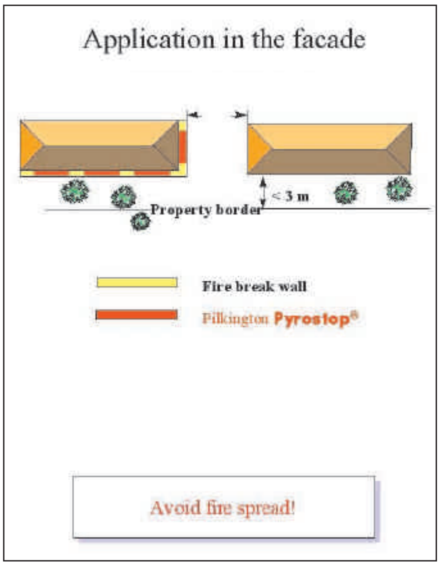
> *Within an integrated strategy for fire containment, it's easy to forget that it isn't only the measures taken within the building that count.*

Fire-resistant façade glazing with Pilkington Pyrodur™ for 30 minutes' integrity in a hospital in Berlin

The solution to build in brick or stone, cover roofs in slate or tile, and avoid combustible claddings would be easy. The only problem with opaque brick construction is that we don't take too well to living and working in enclosed, dark and airless boxes. That's where glazing comes in: we need natural lighting, ventilation and all round vision together with weather protection. Unfortunately, when it comes to fire protection the glazing isn't always an ally. Once fire has taken hold and is fully developed then the fire's progress is dictated by the availability of oxygen. In a fire, glazing can become an external opening with a potentially significant impact, under certain circumstances, on fire growth and development. The size, shape, position and number of glazings can all be influential in terms of burning intensity, compartment fire temperatures, external flame shape and length. Adjacent buildings and adjoining floors can come under threat from flame break out and radiant heat transmitted through the opening.

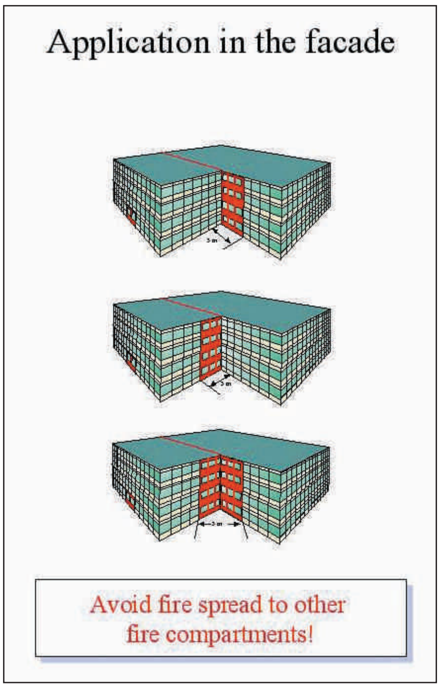
Normal annealed window glass can't in any respect be called fire resistant. It breaks relatively early, generally within five minutes. The cause can be either thermal shock from heat or flames, or thermal stress if a temperature gradient of something like 100°C exists from pane centre to edge. Double glazing doesn't offer significantly better performance. Glass also starts to soften at temperatures increasingly above 600°C, which is fully within the range of a developed fire. Temperature might not be the only factor. Pressure increase within the fire enclosure caused by expansion of the hot gases and heated air may also have an influence in glazing failure, as damage to domestic houses in Australian bush fires recently testify.

> *In a fire, glazing can become an external opening with a potentially significant impact, under certain circumstances, on fire growth and development.*



Pic courtesy of Pilkington

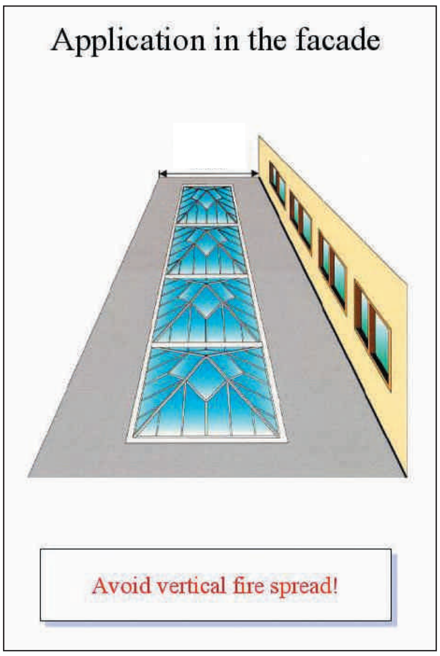
A community-conscious fire safety strategy therefore calls for the application of fire-resistant glazing in facades. Despite the inherently non-fire resistance of window glass, very effective fire-resistant glazing is readily available. How can glass be made fire resistant? Varied solutions have been developed through different technologies. First is wired glass, introduced as long ago as 1895 and still the most widely used fire-resistant glass. Wired glass, such as Pilkington Pyroshield, contains the wire within the body of the glass to hold the glazing together even when thermal shock cracking occurs. It's still a very effective integrity glass when properly framed, holding together to keep back flames and smoke. Another approach is to use specially strengthened



Pic courtesy of Pilkington

Fire-resistant façade glazing with Pilkington Pyrodur™ for 30 minutes' integrity in the Finnish Embassy, Berlin

glass, such as special toughened fire-resistant glazing. Special toughened, however, isn't a fail-safe product. It needs special framing and glazing conditions. Even though stronger than annealed window glass, special toughened can still fail under sufficiently intense thermal shock or thermal gradients (typically 300°C). Failure of special toughened, should it occur, is catastrophic, creating a hole where the glass used to be. Special toughened fire-resistant glazing therefore has to be specified and used very carefully. More reliable resistance can be obtained from toughened borosilicate, which has a better chance of surviving thermal stress because of the relatively



Pic courtesy of Pilkington

The only way to achieve integrity and restriction of transmitted heat is to use a fire-resistant glass that reacts to heat with the formation of an insulating, heat absorbing layer.

low thermal expansion of this type of glass. Glass ceramic with near zero thermal expansion is even more effective in thermal shock situations (but impact shock is another story). All these types are integrity glazings. They remain transparent and therefore allow through significant amounts of radiant heat, even if heat-reflecting coatings are used on the glass.

The only way to achieve integrity and restriction of transmitted heat is to use a fire-resistant glass that reacts to heat with the formation of an insulating, heat absorbing layer. If the effective elimination of transmitted radiant heat is the goal then use a fire-resistant glass with such an interlayer. Two approaches exist. One is based on a high water content gel, cast between two toughened glass panes. The other is based on a special dried interlayer laminated between sheets of normal annealed glass, the same glass that on its own would break within a few minutes in a fire. Such a laminated glass is Pilkington Pyrostop and Pilkington Pyrodur. In the event of fire, the interlayer expands and foams to form an opaque insulating barrier. It blocks out the fire, absorbs the heat and bonds the whole laminated structure together to give a resilient barrier to both heat and flame. Reaction of the interlayer effectively transforms a transparent glass into an opaque firewall. Achievable test times for Pilkington Pyrostop under standard test conditions are 30, 60, 90, 120, and even 180 minutes (in an appropriate frame). For the fire fighter the transformation of the interlayer is a sure indicator of the immediate presence of fire on the other side of the glazing.

Glass has become such a distinctive feature of modern building design because it uniquely offers a tremendous combination of performance, function, aesthetics and environmental value. The evidence is all around us. In addition to its wide range of performance benefits (e.g. thermal insulation, solar control, security, impact protection, colour and decoration) glass in facades in all its possible variants and combinations adds external visual impact and style to modern architecture. Added to these benefits is reduction in the risk of fire spread to the surroundings via the façade. Even a strategy that employs just sections of such fire-resistant glazing at critical locations can be an effective part of an integrated fire safety strategy. Typical applications can be glazing panels either side of external re-entrant corners, around exits, in roof lights and adjacent glazings looking on to flat roofs, glazings and doors looking out on to external fire escapes, ground floor glazings adjacent to external escape ways, and glass walls where the separation with a facing building gives a risk of fire movement from one building to another. In all cases, the fire-resistant glass has to be used within a fire-resistant system, which includes most importantly the frame and the glazing materials.

Given the modern adaptability of fire-resistant glazing, there is no reason why design flexibility has to be compromised by concerns about fire transfer from building to building through the external glazing. Under modern day pressures it's sometimes forgotten, but façade fire-resistant glazing has a specific role to play within a mix of other elements that go together to form a comprehensive fire protection strategy. If nothing else, history serves to remind us.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LPG Técnicas en

A Solid Experience in the Development of Fire Extinguishing Systems

LPG Técnicas en Extinción de Incendios, S.A. was founded in 1985 in L'Hospitalet de Llobregat. Currently LPG's facilities cover 4.400m^2 in Esplugues de Llobregat, one of the most dynamic industrial areas near Barcelona and only 10 minutes drive from Barcelona International Airport.

Since it began LPG has been dedicated to research, design, manufacturing of a large variety of fixed fire extinguishing systems for the protection of property and people. Total flooding systems based on gaseous extinguishing agents FE-13™/HFC-23, HFC-125, FM-200®/HFC-227ea, Inert Gases such as Argon (IG-01) & Nitrogen (IG-100) and CO_2 as well as systems based on water mist technology, are the most prominent within its range of products.

Currently, LPG is proud of its leading position in the Spanish market maintained by the strategy implemented, by its three founder partners – Angel León as Managing Director, Joaquín Pozo as Production Manager and Joan Gascons as Financial Manager. From the start, LPG established new ways considering that the future of Fire Protection would be found in those companies who possessed their own technology and the ability to contrast quality and to adapt to market changes and requirements, as well as a knowledge of sector difficulties; elements required to find new solutions to Customers' problems and demands.

Research and development

LPG is one of the European leaders in engineering development for Halon replacement extinguishing agents, investing 5% of its annual turnover in research and development. Its employees and collaborators are active members of the industries main associations and organizations; CEN, EUROFEU, ISO, NFPA and IWMA. LPG also participates in sector professional associations in each country where it takes an active part, such as the BFPSA in England. LPG facilities include real fire test fixed rooms of 150 and 30m^3 capacity respectively, they are adaptable to specific dimensions for special tests These facilities together with the technical equipment available allow LPG to perform different tests and studies, such as:

- Discharge at real scale with different types of nozzles, ducts, cylinders and filling densities. Discharge time calculations.
- Calculation for extinguishing agent concentrations used in different classes of fires and types of materials.
- Comparative studies of extinguishment effectiveness among several agents.
- Water mist specific protection designs.
- Development of computer programmes for hydraulic system calculations.

LPG has its Research and Development capacity at the service of its customers and the industry as a whole. As a result of such collaboration, LPG has developed, among other products, the following:

- ARGON (IG-01). 200 & 300 bar inert gas extinguishing system. Highly efficient and 100% ecological.
- WATER MIST. High-pressure micro water drops fire extinguishing and/or control System. 100% ecological.
- Water Mist Specific Applications for the protection of KITCHEN HOODS AND MECHANICAL ESCALATORS.
- INTELLIGENT WEIGHING SYSTEM. For continuous control of condition of cylinder charge in liquidised gas systems.
- VALVES. Valves designed and manufactured by LPG operate in conjunction with the gas pressure stored within the cylinder. The cylinder valve is opened by means of a solenoid allowing the gas to be released. They offer a great flexible adaptability for all actuation and release systems currently used in the market, even allowing combinations of several of them. Incorporated in the design is a protection against accidental actuation due to small leakages. They also allow checking and maintenance of all essential elements contained in a fixed extinguishing system, at the time of commissioning and later for system preventive maintenance, thus preventing the risk of accidental discharge.

LPG has developed GESPED and FIRENET software for the design and hydraulic calculation of their extinguishing agents. It's possible to select design standards and desired extinguishing agent according to the application in each country. These programmes allow each customer to develop his own offers and negotiate his orders in an easy and

Extinción de Incendios, S.A.

convenient way. All product innovations and improvements that the company has introduced possess pertinent invention patents and utility models.

Commitment with product quality and certification

In 1996 LPG obtained ISO 9001 Certificate of Quality Assurance by TÜV Rheinland and in 1998 ISO 9002 certification by LPCB, both currently in force after renewals.

The LPG Quality Assurance System carries out inspections at raw material reception, at production processes, at final tests and lastly on deliveries of goods. Quality Assurance Laboratory designs its own Control Drawings and Product Follow-up Technical Records. 100% of essential components undergo functional and pressure tests, especially all LPG valve models, thus ensuring perfect reliability and safety. A code marking system and series number is used to facilitate a tracking system to ensure the follow up and tests of all manufactured products.

All LPG systems and components are designed and developed in accordance with most demanding international standards such as ISO 14520, NFPA 2001 for clean agents, and NFPA 750 for Water Mist. This allows the organisation to keep a privileged position in respect to fulfilment and application of international regulations.

LPG, in compliance with national and foreign regulations, uses approved cylinders in accordance with BS 5045 Part 2 and Transportable Pressure Equipment Directive EC/36/1999.

LPG is the only Spanish manufacturer holding certifications for its systems and components by the most renowned independent companies, such as VdS in Germany, LPCB in United Kingdom, CNPP in France and VNIIPO in Russia.

Engineering and customer consulting services

The expert team in Project Engineering has executed, among other fire protection projects, Bangkok Cable Railway in Thailand which comprises 36 stations, administrative building and several substations; an Oil Refinery in Esmeraldas, Ecuador and the Military Hospital in Cairo, Egypt which covers the main building of 7 floors (125,000m^2), the Oncology Center (1,000m^2) and the power building with 8 transformers, generator room and medium and low voltage rooms.

For the purpose of offering maximum after sales service to customers, LPG has available cylinder refilling and stamping stations in its assembly plants in Barcelona and Madrid, as well as in its subsidiaries in France, United Kingdom and Portugal.

Environmental commitment

LPG's commitment to the environment means focusing research and development on environmental friendly fire extinguishing systems. Currently LPG has available systems, which use 100% ecological extinguishing agents such as the Water Mist System, Argon Inert Gas System and Nitrogen. LPG has also developed applied engineering for chemical extinguishing agents FE-13™, HFC-125 and FM-200™. The Ozone depletion power of these agents is zero and they have a low greenhouse effect, therefore, they are an efficient alternative to Halon.

Since 1998 LPG has administrative authorization to act as residual administrator under code E-584.98. LPG carries out the activity of collecting and storing Halon 1301 and Halon 1211 still kept in the old fire extinguishing system park in our country, for later valuation or elimination in an acceptable safe and ecological way. LPG has designed and developed equipment for Halon charge and pouring from one container into another for decommissioned operations, thus preventing harmful emissions to environment.

International expansion and human resources

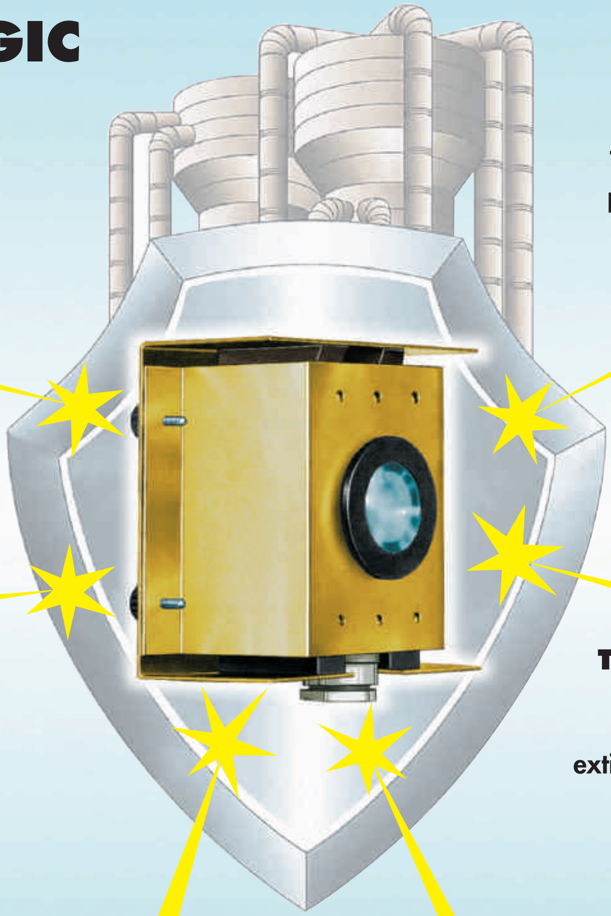
LPG has always thought that the best base for its product development is to satisfy customer's requirements. Most of our personnel are engineers or holders of other high qualifications who have the ability to deal with market changes and demands.

LPG employs 65 people in Spain, distributed between it's Barcelona and Madrid centres. LPG counts on a technical commercial team who in close collaboration with the customers, advise and provide solutions to their problems. LPG encourages its technical team to participate in work groups of the main international associations and organizations in the sector, collaborating actively in the development of new standards for design and safety as well as pertinent application to fire protection systems.

LPG has opened branch offices in Portugal, France, United Kingdom, Turkey and South America. Native personnel from each country run the day-to-day business.

Apart from these branch offices, LPG operates in more than 40 countries through its network of sales agents and distributors.

All this expansion would not have been possible without the skill and dedication of the whole LPG organization, which has learnt to understand and satisfy customer's requirements at all times.



RIV-601/F
IR FLAME
DETECTOR
CE
CONTROL LOGIC

PIDs as a HazMat Response Tool

Pic courtesy of RAE Systems, Inc.

PHOTO IONIZATION DETECTORS (PID's) measure low levels (0-2000ppm) of VOCs (Volatile Organic Compounds) and other toxic gases. Many HazMat (Hazardous Material) incidents involve VOCs and the sensitivity of PID's to VOC exposure make them an invaluable tool for making HazMat decisions including:

- Initial Personal Protective Equipment assessment (how you need to dress out for an incident)
- Leak detection
- Perimeter establishment and maintenance
- Spill delineation
- Decontamination
- Remediation

Recent breakthroughs in PID technology increase their usefulness by making PIDs more rugged, more reliable and more affordable. More HazMat responders may want to consider adding PIDs to their inventory of gas monitors.

What Are Some Common VOCs?

VOCs are the chemical compounds that keep industry going and include:

- Fuels
- Oils, Degreasers, Heat Transfer Fluids
- Solvents, Paints
- Plastics, Resins and their precursors

Why Not Use An LEL Monitor?

Many VOC's are flammable and may be detected by the LEL (Lower Explosive Limit) or combustible gas sensors found in virtually every multigas monitor. However, LEL sensors are not particularly useful in measuring toxicity because they do not have enough sensitivity.

LEL Sensors Measure Explosivity, Not Toxicity

LEL sensors measure percent of LEL. For example, Gasoline has an LEL of 1.4%. Therefore, 100% of LEL is 14,000ppm of gasoline, 10% of LEL is 1,400ppm of gasoline and 1% of LEL is 140ppm of gasoline. 140ppm of gasoline is the lowest amount of vapor that the LEL monitor can detect. Gasoline has a TWA of 300ppm and a STEL of 500ppm; this does not make LEL sensors well suited for measuring gasoline vapors because they simply don't provide adequate resolution. ***LEL sensors measure explosivity, not toxicity.*** Many Volatile Organic Compounds (VOCs) are potentially toxic at levels that are well below their explosive levels and below the sensitivity of the LEL sensors.

LEL sensors were designed to measure Methane in coal mines. Effectively, this sensor measures the temperature at which gas burns.

LEL Sensors Limitations

Two mechanisms affect the performance and reduce the effectiveness of LEL sensors when applied to anaything but methane:

- **Gases burn with different heat**

Some gases burn hot and some burn relatively cool. These differing physical characteristics lead to difficulties when using LEL sensors. For example, 100% of LEL Methane (5% methane by volume) burns with twice the heat of 100% of LEL Propane (2.0 propane by volume).

- **"Heavier" hydrocarbon vapors have difficulty diffusing into the LEL sensor and limit LEL output**

Some "Heavier" hydrocarbon vapors have difficulty diffusing through the sintered metal flame arrestor on LEL sensors. This flame arrestor is necessary to prevent the sensor itself from starting a fire and does not prevent gases like methane, propane and ethane from reaching the sensor. However, hydrocarbons like gasoline, diesel, solvents, etc, diffuse through the flame arrestor slower so that less vapor reaches the sensor and gives less output.

Measuring in PPM: The Maturation of Gas Monitors

The initial role of confined space monitors was to stop killing people in confined spaces due to the acute (immediate) affects of toxic or explosive gases. *LEL sensors made sure that workers got home at night.* As gas monitoring has matured HazMat professionals have become increasingly concerned with the chronic (long-term) affects of many gases and vapors. Measuring at these low levels requires gas measurement tools that

Pic courtesy of RAE Systems, Inc.

measure in Parts Per Million (PPM). ***Measuring in PPM lets workers enjoy retirement!*** We can use the following methods to measure VOCs (Volatile Organic Compounds) at ppm levels:

- **Colorimetric Tubes:** Lack accuracy and have other shortcomings.
- **Metal Oxide Sensors (MOS):** Lack accuracy and sensitivity.
- **Portable Gas Chromatography/Mass Spectrometry (GC/MS):** Selective and very accurate, but not continuous and very expensive.
- **FID (Flame Ionization Detector):** limited by large size, weight and the need to carry hydrogen.
- **PID:** Used properly, a PID is the best choice to provide responders with confidence in many HazMat environments.

Why Not Use Colorimetric Tubes

Colorimetric tubes (often referred to as "Drager" tubes) have been the foundation of HazMat response gas detection for years. They are an accepted and proven means of measuring many toxic gases and vapors at ppm levels. Colorimetric tubes are inexpensive, but have limitations:

- Tubes only provide "Snap-shots," like a "Polaroid" camera. A tube cannot be put on personnel and be expected to alarm when conditions change or become dangerous.
- The "spot check" nature of tubes also makes them more prone to sample error.
- Tubes are slow to respond. They give readings in minutes rather than seconds.
- Bellows type tube pumps provide 25% accuracy at best and piston/syringe style tubes provide 15% accuracy, so if the true concentration of a gas is 100ppm a bellows-type tube can read between 75 and 125ppm!
- Tube readings are subject to interpretation.
- A large stock of tubes is expensive.
- Tubes expire.
- There are a limited number of tube chemistries so tubes are not as specific as many would want to believe.

Portable GC/MS

Gas Chromatography/Mass Spectrometry (GC/MS) can be selective but not continuous. It can only take "snapshots" and cannot provide continuous monitoring with alarms. Continuous, pumped, monitors, sampling at 100-500cc/min, are less likely to be "fooled" by a false high or low readings. In addition, no GC/MS is portable or rugged enough to be worn continuously by a worker. Therefore, a GC/MS is also a reactive rather than a proactive form of protection. A GC/MS can tell a story in snapshots rather than continuous, instantaneous video. Finally, GC/MS tends to be prohibitively expensive.

Flame Ionization Detectors (FIDs)

Flame Ionization Detectors (FIDs) respond to a broad-range of organic compounds but are non-selective. While their linearity is excellent, their use is limited by their large size and weight, the need to carry a hydrogen cylinder. FIDs are relatively expensive and maintenance intensive and this limits their use in most industries. PIDs and FIDs are often referred to generically as Organic Vapor Analyzers or OVAs.

Photo Ionization Detectors (PIDs)

A PID is essentially a Gas Chromatograph without its separation column and therefore, a PID can provide excellent accuracy. Some say that while the PID is clearly sensitive and accurate to many toxic gases and vapors at ppm levels, its lack of selectivity reduces its usefulness. The advantage of the PID is that while it is not selective, it is a small, continuous monitor that can provide instantaneous feedback to workers. This lets them take control of their actions and allows them to perform their tasks with confidence that they are not being exposed to hazardous chemicals. Like a VCR, the PID measures continuously and its results can be datalogged and "played-back" instantly.

PART 2

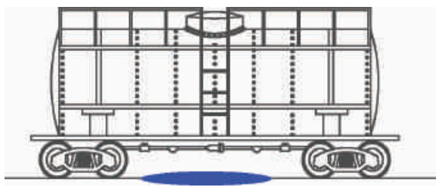
PIDs As a Powerful HazMat Tool!

Now PIDs measure 0-10,000ppm (parts per million) with resolution as low as 1 ppb (parts per billion) and therefore are a very appropriate means of measuring gasoline (and other toxic gases and vapors) at the low levels leading to chronic toxicity. Breakthroughs in PID technology have addressed PID shortcomings and now provide HazMat teams with a powerful yet affordable measurement technology. The PIDs ability to provide accurate measurement in a wide range of situations makes it a powerful tool for the following HazMat uses:

- Initial PPE assessment
- Leak detection
- Perimeter establishment and maintenance
- Spill delineation
- Decontamination
- Remediation

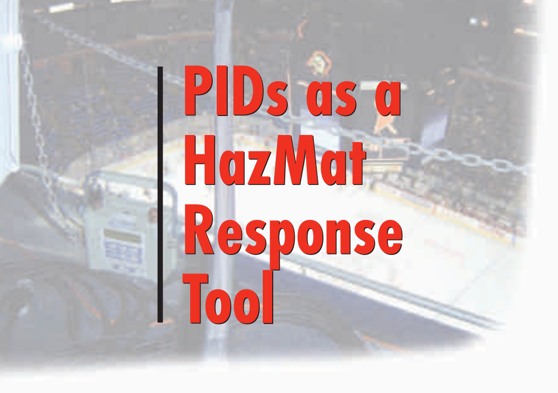
Initial PPE Assessment

When approaching a potential HazMat incident the responder must make a PPE (Personal Protective Equipment) decision. Some potential incidents may not be an "incident" at all. Some incidents may initially appear to have no contamination yet require significant levels of PPE. ***No monitor will provide all the answers to a responder.*** But the PID is an excellent aid in this decision making process. For many incidents the PID lets the responder identify the presence or absence of potentially toxic gases or vapors.



A HazMat contractor was called by a railroad to respond to a leaking tank car on a hot (95°F), humid (95%RH) summer day. According to the manifest, the tank car was loaded with benzene. Due to the carcinogenic nature of benzene (PEL of 1ppm) the HazMat contractor chose to dress-out in Level A.


intent & fear.
If the "intent" is to create "fear"
then it's terrorism no matter what...



PIDs as a HazMat Response Tool

Pic courtesy of RAE Systems, Inc.

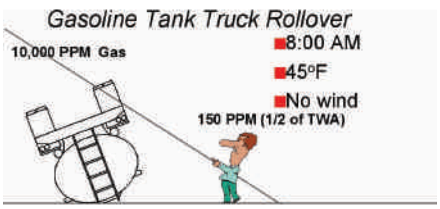
But, because it was a hot summer day, this potentially exposed the responders to heat stress injuries. In the assessment of the "leaking" tank car it was found that the puddle under the car was coming from water condensation not dripping benzene. The car had been loaded at 65°F and the high ambient temperature combined with relative humidity above 95% produced a puddle of water not benzene.

A PID would have helped the contractor determine if there was an ionizable vapor present. Because the manifest identified the tank car contents as benzene, and benzene is readily ionizable, the contractor could have ruled out the presence of benzene vapors using a PID. This would reduce the cost of the response and prevent the potential of heat-stress injuries from dressing out in full Level A encapsulation.

Leak Detection with a PID

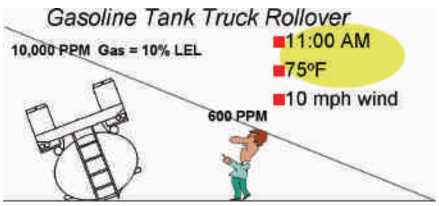
Often a leak is not readily apparent and it must first be located before it can be effectively stopped. Anytime that a gas or vapor is released into air it disperses outwards from the source of the leak. As the gas or vapor disperses it is diluted by ambient air until at some point the gas or vapor cannot be detected. This process establishes a concentration gradient where the concentration of the gas or vapor is greatest at the source of the leak and the concentration is effectively zero when the gas or vapor is fully dispersed. The PID allows us to measure and "see" concentration gradients for many gases and vapors that we would otherwise be unable to detect. We can use the PID like a "Geiger-Counter" to "see" the concentration gradient and follow the increasing concentration of gas or vapor to its source.

Perimeter Monitoring with a PID



HazMat technicians assess an incident and set a perimeter based upon the toxicity of the gas or vapor, the temperature, wind direction and other factors. However, perimeters are usually manned by people without a high degree of experience.

As conditions change, perimeters often are not adjusted because perimeter workers do not have the experience to recognize that the conditions have changed. The experienced HazMat technicians are typically focused upon the problem of dealing with complications of the original spill. Therefore, perimeter workers are often unprotected from changing conditions that may require movement of a perimeter away from the spill site. For many HazMat incidents, a PID allows those manning a perimeter line to adjust the line in response to changing conditions. PIDs can provide instantaneous alarms that can warn perimeter workers when to retreat from the incident for everything from ammonia to xylene.



Datalogging as a Tool

Datalogging PIDs provide supervisors with documentation of exposure levels and provide evidence to justify evacuations should they be required. Some HazMat teams already datalog their incidents where there has been a chemical release.

But most only datalog those incidents when the datalog showed positive results. This misses more than half of the value of datalogging. Many times a negative result on a datalog is more beneficial than a positive result. Saving a "non-detect" can help to quickly establish that a spill of an ionizable compound was promptly and properly contained. This can save time and money if the spill ever results in legal action.

PIDs for Spill Delineation

In the course of a HazMat incident many liquids can be present such as water, fuel, engine fluids and firefighting foam. With all these liquids present, the PID provides an excellent tool for responders to zero in on spilled fuel rather than wasting time, and absorbent, on pavement that is only wet with water. A PID will respond positively to contaminated pavement and will not respond to pavement wet with water. This allows responders to quickly find the spill and reduce the money spent on absorbent.

Using a PID for Decontamination

Hazardous materials often get on responders. For ionizable compounds like fuels and other VOCs, a PID is a quick and effective means of determining if a responder requires decontamination, and if decontamination has been complete. This may make it easier for a HazMat team to make a decision to reuse an encapsulation suit because it was not contaminated. The PID is swept over areas of suspected contamination. It will respond positively to areas that are contaminated with ionizable compounds and

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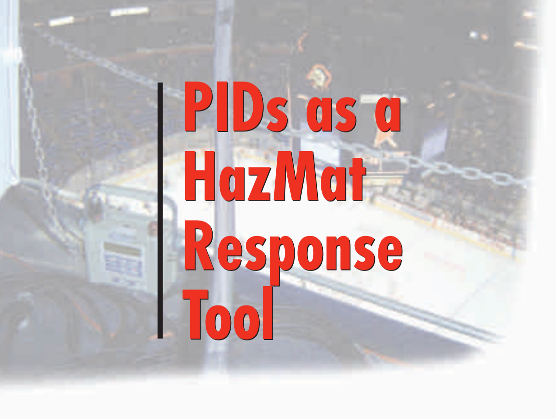


PIDs as a HazMat Response Tool

it will not respond to clean or properly decontaminated areas.

Often a first responder to a fuel spill incident gets gasoline on his flame-retardant turnout clothing. Absorbed gasoline will compromise the flame-retardant properties of turnout gear. The PID will quickly respond to contamination and identify this dangerous condition so that the turnout gear can be properly laundered before going into a structural firefighting situation. This same sensitivity to hydrocarbons makes PIDs ideally suited for arson investigation (Please reference RAE Systems publication AP-207: "PIDs as an Arson Investigation Tool").

Using a PID for Remediation

While the goal of any HazMat response team is to contain and prevent spills, hazardous materials often evade containment; contaminating nearby soil and water. Many jurisdictions (counties, states, countries) have defined the concentration at which remediative action must take place. If there has been a fuel spill that has been contained to the road surface and it has been completely removed by absorbent, further remediative action may not be required. However, if fuel product has evaded the best efforts for containment, the fuel may have contaminated the surrounding soil or water. Some jurisdictions have an action level of 100ppm TPH in a sample headspace (Total Petroleum Hydrocarbons) for further remediation. If soil samples show only 10ppm of contamination in the headspace of a sample, remediation may not be required. Soil samples of 200ppm would require further remediation.

The PID is one of the best-recognized tools for making such a determination for environmental officials and environmental contractors. HazMat responders now have an effective decision making tool that reduces guesswork as to whether a contractor should be called for further remediative action. This can allow responders to quickly reopen areas that were at first thought to be contaminated.

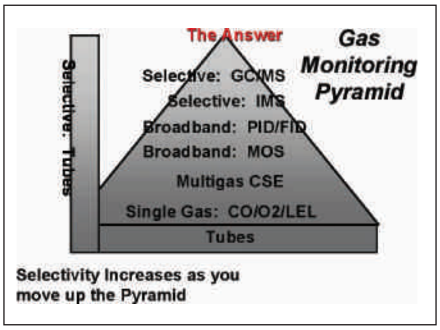
Because of variations in the weather and soil conditions it is best to do a headspace sample on suspect soil or water rather than just waving the PID probe over the suspicious area. This is because on a cold day, VOCs are less likely to evaporate and waving the probe over the area might miss contamination. Conversely, on a hot day, waving the probe over a contaminated area could overestimate contamination.

How To Do a Headspace Sample

1. Put contaminated soil or water in a container or even a plastic bag
2. Cover/seal the container and bring it up to room temperature (~15 min)
3. Put PID probe into container and sample
4. Generally <100ppm is good (Caution: 100ppm is a general guideline. Check your local regulations for specific rules, reference TN-118).

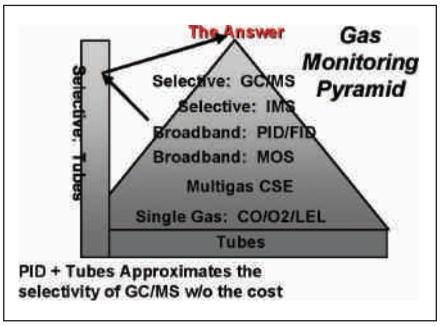
Where Do PIDs Fit Into a Total Gas Monitoring Program?

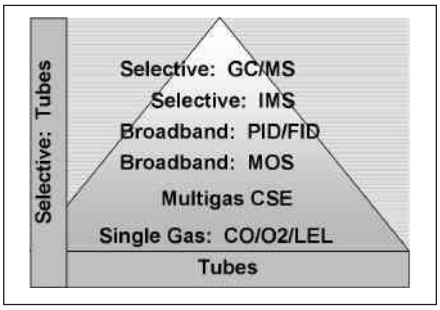
PIDs are an important part of a gas monitoring program. However, a gas monitoring program must contain a variety of options that build towards specificity and sensitivity. A gas-monitoring program can be represented by a pyramid that builds upon techniques that increase in cost and sophistication until the answer is reached at the top of the pyramid. At its foundation are colorimetric tubes then it builds to single gas monitors (like CO monitors) and then progresses to multigas Confined Space Monitors. From there, a gas-monitoring pyramid can add broadband monitoring of chemicals (via PIDs) and finally move on to the top of the pyramid with specific techniques from colorimetric tubes to IMS (Ion Mobility Spectroscopy) and GC/MS (Gas Chromatography/Mass Spectroscopy).



However, it is dangerous to jump to the top of the gas-monitoring pyramid if one has not established a proper foundation. For example, if one's entire budget is spent on an expensive GC/MS, then little or none might be left for important broadband scanning devices. For those that don't have the budget or the demand for costly specific monitors like GC/MS or IMS the same ground can be covered with a continuous monitoring PID and a simple specific detector like a colorimetric ("Draeger") tube as can be seen in the diagram below.

Broadband scanning devices like PIDs are important, because they are simpler and can be fielded in greater quantities to provide more widespread protection. In addition, broadband detectors like PIDs can provide clues that a more specific measurement technique like GC/MS or even colorimetric tubes may be needed. In this case PIDs act as "scouts" or "survey" instruments for the more specific and complicated detectors.





PIDs: An Excellent Detective Tool

A PID is a sensitive and accurate detective tool for HazMat Responders. Like a criminologist's magnifying lens helps to identify fingerprints; PIDs allows HazMat "detectives" to identify the presence of gases and vapors and then quantify them. A magnifying lens does not identify fingerprints. But good detective work quickly can identify them. The same holds for toxic vapors. While a PID cannot identify toxic gases and vapors, good detective work can quickly provide identities and the PID can then provide the most accurate form of field measurement short of a Gas Chromatograph (GC). With the increasing concerns of the affects of even low levels of chemical releases, PIDs offer responders an excellent aid in their detective work. Properly used, PIDs can help identify and measure the potential toxic VOCs that make up the majority of HazMat incidents.

REFERENCES

Carol J. Maslanski, Steven P. Maslansky: Photoionization Detectors in *Air Monitoring Instrumentation*, New York, Van Nostrand Reinhold, 1993

NIOSH: *Pocket Guide to Chemical Hazards*, NIOSH Publications, Cincinnati, OH 1994

RAE Systems: Correction Factors and Ionization Potentials (Technical Note TN-106)

RAE Systems: Setting Alarm Limits for Mixtures (Technical Note TN-130)

RAE Systems: PIDs as a HazMat Response Tool (Application Note AP-203)

RAE Systems: PID Training Outline

Enquiries: www.essexind.com

Enquiries: fireboy-xintex.com

Enquiries: www.thefireshop.com

Cable Approvals

By Angela Richards of LPCB

The vast majority of today's commercial, industrial and retail premises have a fire detection and alarm system installed. The purpose of the fire detection and alarm system is to detect a fire and alert the building inhabitants by means of an alarm that the building needs to be evacuated.

Cable fire in a roof void.

IT GOES WITHOUT SAYING that a fire detection and alarm system must be designed, installed, commissioned and maintained by experts. Fire alarm systems can be complex, often comprising a panel, cabling, various detector types (optical, ionisation, beam, heat), manual call points, line units, sounders and so on; this article focuses on the cable element.

The effectiveness of a fire alarm system depends on the ability of the components to continue to function for a prolonged period of time after being subjected to fire, i.e. cabling to sounders, panels and power supplies needs to perform for a minimum of 30 minutes. Choosing the correct fire performance cable is therefore critical.

However this is not so simple. There is so much jargon to wade through – fire tested . . . meets the requirements of . . . tested to . . . complies with. . . . How do you know which cable to select?

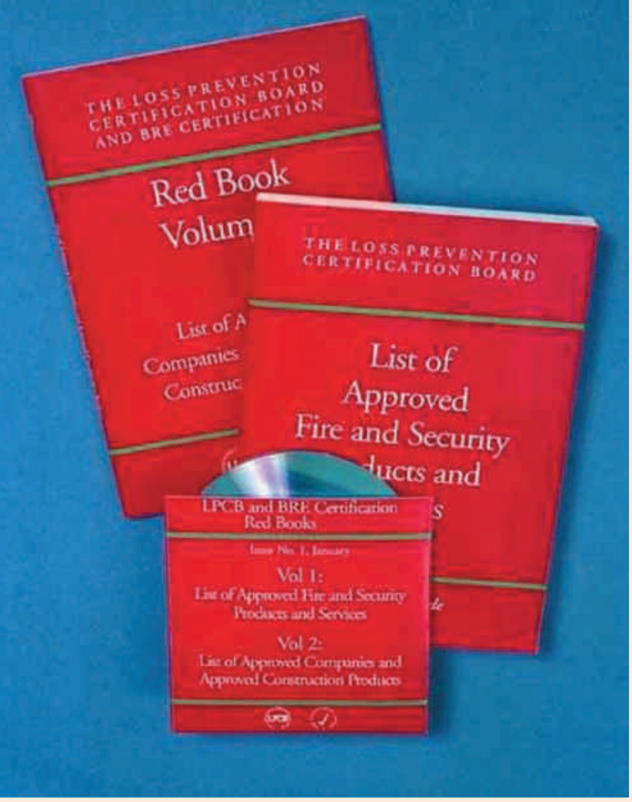
CERTIFICATION

One method of ensuring that the cable meets the standard is to chose one that is certificated by a nationally accredited certification body. Certification by LPCB is third party confirmation that the product meets and continues to meet the appropriate standard. A test is basically a snapshot showing that the product passed the test on a given day, whereas certification, through regular audits, ensures that the product continues to comply with the standard and meet the specification. The certification process involves rigorous assessment and testing of products and services to ensure that they meet and continue to meet quality standards set by a team of experts which include manufacturers, installers, designers, clients, regulators, insurers, engineers and scientists.

All LPCB certification cable is fully tested and certificated to the full range of applicable specifications and standards. Audits at the manufacturer's site are carried out and samples are taken at random from various batches. The samples are then returned to our own state of the art facility near London where we undertake a full range of tests, including fire testing.

There are many approval bodies including many with their own strong brands, not all of them, however, have their own on-site testing facilities and expertise. LPCB, together with its predecessor the Fire Offices' Committee (FOC) has been involved for over 150 years in working with specifiers including clients, insurers, and regulators to set the standards necessary to ensure that the product is fit for purpose. All LPCB certificated cable is fully tested and certificated to the applicable standard which can be BS, BS EN or IEC (listed at end of article). Most of the testing is carried out on site by LPCB's sister company BRE, and LPCB is the only UKAS accredited Certification Body to be able to offer this one-stop shop service for fire performance cable approval in the UK.

Cabling used for fire detection and alarm signalling systems must demonstrate its mechanical, electrical and insulation performance under fire conditions. Clause 26 of BS 5839-1 2002 –



Fire detection and alarm systems for buildings – Code of practice for system design, installation and servicing, specifies the types of cables which are considered to be acceptable for use in fire alarm installations. Reference should be made to this clause to select the required standards and classifications.

LPCB has set up a scheme to test and approve cables to the special requirements for 'standard' and 'enhanced' fire resisting cables specified in BS 5839-1:2002.

COMMUNICATIONS CABLES

Cables alone are very rarely the source of a fire, but some cable can add to the potential for spread of flame and to the fire load. LPCB has just extended the scope of cable approvals to include communication and power cables. Cables contained within concealed spaces such as roof and under floor voids can cause undetected spread of smoke and fire. This extension in scope now means that LPCB can offer approval of all fire performance cables.

INSTALLATION

Even the most technologically advanced fire detection and alarm systems will not work if they are not installed correctly. LPCB also runs installer schemes and the applicable scheme for fire detection and alarm systems is LPS 1014 *Requirements for certification of fire detection and alarm systems firms.*

This scheme calls for the issue of LPCB Certificates of Conformity by the approved company. These certificates cover all aspects of the installation and provides the specifier with a single point of responsibility for the contract.

LISTING

Once we are satisfied that a product, service or company meets the required standard, we issue a certificate and list them in the relevant 'Red Book', either the *List of Approved Fire and Security Products and Services* or *List of Approved Companies and Construction Products*. Listing in the Red Book is a very useful marketing tool for the approved companies as thousands of specifiers and insurers around the world use the Red Book to select their suppliers. The Red Books are published in January each year and on CD ROM in January and June of each year. These publications are mailed out to a database throughout the world including insurers, clients, architects, surveyors, engineers, etc., and many thousands of copies are handed out at exhibitions, seminars and presentations. A "live" copy of the Red Book is continually updated on our website at www.redbooklive.com and we currently receive approximately 8,000 hits per month.

So, how do you check whether a product, system, service or installer is approved by LPCB or BRE Certification? Unfortunately, there are many false claims of approval in the market place with claims of "tested by LPCB", "tested to" an LPS or "complies with". If you are still unsure, give our helpdesk a call on 01923 664100. Each approved manufacturer or service provider will also hold a certificate. If you are looking at an installed product, the specimen, packaging or documentation should also show one of the following marks:

For schemes which are UKAS accredited

So when it comes to selecting a cable, choose an LPCB approved company – you know it makes sense!

LPCB currently offer cable approval to the following standards:

- BS 5839-1: 2002 – Clause (26.2 d & e 'standard' and 'enhanced' fire resisting cable) Fire detection and alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance
- BS 60702-1: 2002 – Mineral insulated cables and their terminations with a rated voltage not exceeding 750V
- BS 6387: 1994 – Performance requirements for cables required to maintain circuit integrity under fire conditions.
- BS 7629: Part 1 or 2:1997 – Thermosetting insulated cables with limited circuit integrity when affected by fire.
- BS 7846: 2000 – Specification for 600/1000V armoured fire-resistant electric cables having low emission of smoke and corrosive gases when affected by fire.
- BS EN 13501-1: 2002 – Fire classification of construction products & building elements. Classification using test data from reaction to fire tests
- BS EN 13823: 2002 – Single burning item.
- BS EN 50267-2-1: 1999 – Common test method for cables under fire conditions – Tests on gases evolved during combustion of materials from cables – procedures – Determination of the amount of halogen acid gas
- BS EN ISO 1716: 2002 – Determination of heat of combustion.
- BS EN ISO 11925-2: 2002 – Single flame source test.
- IEC (60)331: part 21: 1999 – Tests for electric cables under fire conditions – Circuit integrity – Procedures and requirements – Cables of rated voltage up to and including 0,6/1,0kV
- IEC (60)332-3: 2nd Edition – Tests on electric cables under fire conditions part 3: tests on bunched wires or cables.
- BS EN 50268-2: 2000 (supersedes BS 7622) – Common test methods for cables under fire conditions. Measurement of smoke density of cables burning under defined conditions.
- BS EN 50200: 2000 – Method of test for resistance to fire of unprotected small cables for use in emergency circuit.
- NFPA 262 (UL 910) – Test for flame propagation and smoke density values for electric and optical fibre cables used in spaces transporting environmental air.

For further information on LPCB approved products, standards, etc. please visit our website at www.redbooklive.com.

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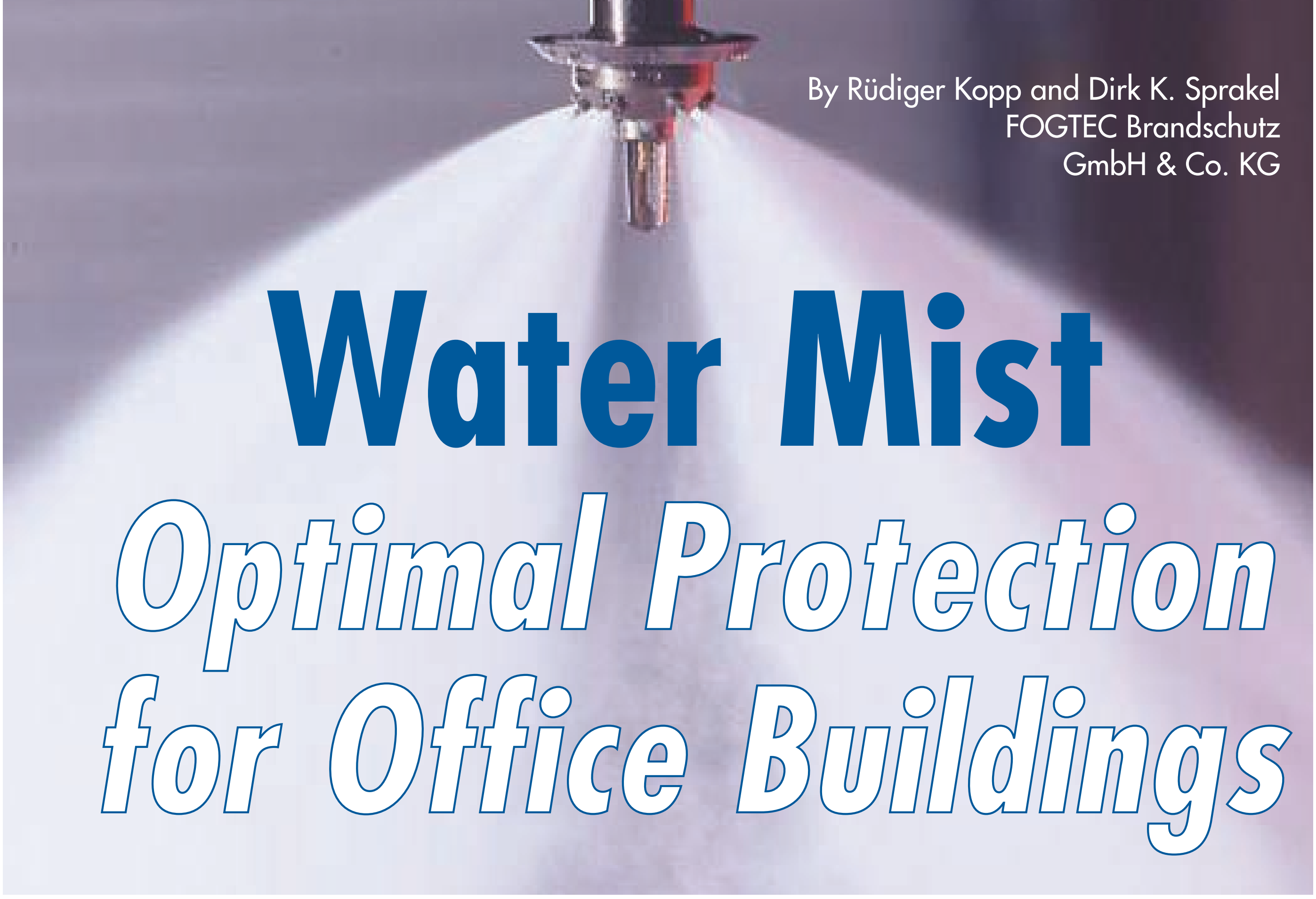


By Rüdiger Kopp and Dirk K. Sprakel
FOGTEC Brandschutz
GmbH & Co. KG

Water Mist
Optimal Protection for Office Buildings

Pic courtesy of FOGTEC GmbH

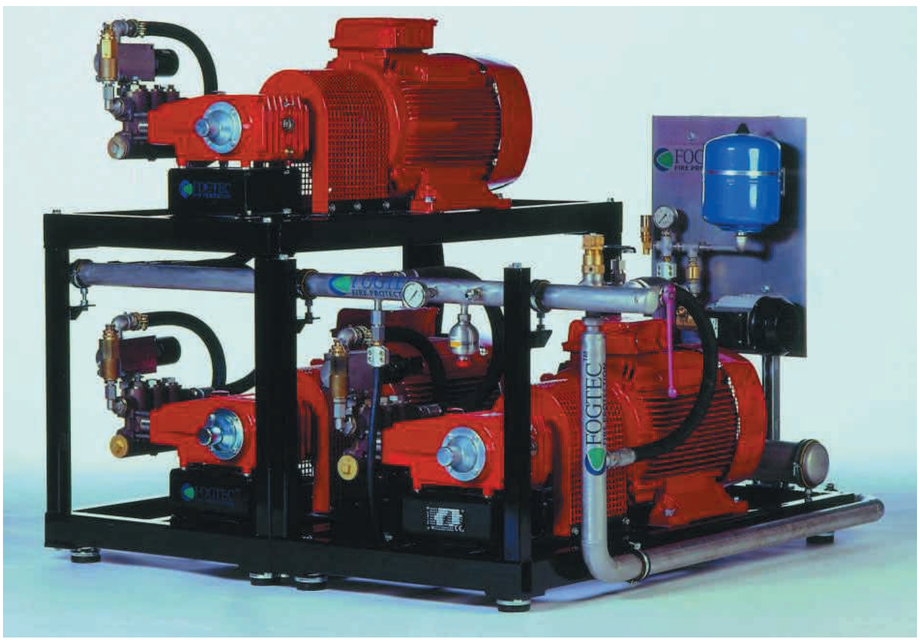
ALREADY FOR QUITE SOME TIME, fire protection experts have pointed at the problems related with traditional fire extinguishing systems. Sprinkler systems consume large amounts of water and thus produce contaminated extinguishing water in corresponding proportions.

Owing to the high physical efficiency of water mist, only 10% of the water amount of a conventional sprinkler system is required. In most cases no storing of water in sprinkler tanks is required. Soil contamination and other damages by running off extinguishing water is reduced to a minimum.

Impressive fire-fighting results in real fire conditions justify the investment costs in water mist technology, which today may partly be higher in comparison to conventional sprinkler systems.

The possibilities of fire fighting with clean water in the form of smallest droplets have already been known since the thirties. By developing state-of-the-art components, the fire-extinguishing technique could be optimized to a level that makes it possible to offer highly effective water mist extinguishing systems as an alternative to sprinkler and gas extinguishing systems.

A large part of the conventional fire-extinguishing techniques such a sprinkler, gas, powder and foam extinguishing systems, still continue to have enormous disadvantages in terms of resulting water damage, environmental compatibility, availability, toxicity, or refill costs. Frequently, the consequential damage caused by extinguishing media is greater than the loss by the fire. For many applications, the high-pressure water mist technology is a true alternative, with none of the disadvantages listed above. The use of high-pressure water mist for the protection of office buildings and similar buildings is just one of the endless applications of high-pressure water mist. For several years the water mist technology now has been used for such buildings. The article explains why and how high pressure water mist is used in this application.



Pic courtesy of FOGTEC GmbH

Pic courtesy of FOGTEC GmbH

PRINCIPLE

Water for fire fighting is effective for many reasons; one of the most effective ways is by cooling. To achieve this in a fire scenario often requires many thousands of liters of water to suppress and extinguish the fire. The primary reason for this is that the vast majority of the water used is wasted; this can be seen by the amount of 'run off' visible as pools of water. This is because only the surface area of the water drop or stream comes into contact with the energy from the fire (the heat), the rest is wasted.

HIGH PRESSURE WATER MIST NOZZLE

If the water being used is atomized into a very fine mist most of the water is used to absorb the energy thus extinguishing or controlling the fire. This is because the droplet, being so fine, converts to steam at a very fast rate and it is this conversion, which absorbs the energy (heat) and dramatically reduces the combustion rate. Once the fire has been extinguished the droplets being discharged continue the effect by removing heat from the fuel source i.e. plastics, fabrics, wood, cable, paper etc and this prevents re-ignition.

Additionally, as the water absorbs the heat, it converts to steam; this creates an inerting effect by oxygen depletion as it starves the combusting fuel of the very vital ingredient oxygen. This only effects the fire at the flame base and does not reduce oxygen levels elsewhere within the risk area.

Water mist fire-fighting systems use clean water as extinguishing medium. Through specifically developed nozzles, water is atomized into very fine droplets generating water mist. A high system pressure allows the formation of smallest droplets, thus providing the largest possible heat exchange surface. At the same time, the droplets attain sufficient momentum in order to get to the fire source.

Pic courtesy of FOGTEC GmbH

SYSTEM TESTING

Water mist is not a gaseous agent and therefore cannot be approved like a gaseous agent. Likewise water mist cannot be directly compared with conventional sprinkler systems where design is based on two dimensional water calculations.

For each application the required nozzle type, droplet distribution, flow rate and discharge time have to be individually determined to provide the optimum protection of the relevant risk.

The International Maritime Organisation (IMO) has established guidelines for the approval and installation of water mist systems in accommodation areas on board of ships. Similar to these test guidelines, protocols for light hazard applications on land have been established or are presently in preparation, i.e. by FM and CEN.

FIRE TEST ARRANGEMENT

The test set-up for light hazards includes scenarios for smaller and medium size rooms with a door opening as well as open spaces without area limitations.

Full-scale fire test results have proven an outstanding safety level, especially taking into account the smoke washing ability of water mist.

Fire test have also proven the extraordinary heat shielding effect of water mist, reducing the heat radiation onto surfaces in the protection area to a level, where no structural damage is to be expected. This means that structural materials, e.g. steel and glass, on a case-by-case evaluation can be reduced in their fire resistance classification.

SYSTEM LAYOUT

In comparison with conventional sprinkler systems extensive design savings can be achieved using water mist systems. An office building protected with sprinklers according to standards for light hazard, requests for a maximum system operation area of 150m^2. High-pressure water mist systems are designed in analogy to this. The nozzle area coverage of water mist systems is comparable to those of conventional sprinklers. The mayor difference is reflected in the flow rates discharged, ranging at only 10 to 30% of conventional sprinklers.

Due to these small flow rates, in most cases high-pressure

Pic courtesy of FOGTEC GmbH

water mist systems can directly be supplied with fresh water by the town's main, only necessitating a small break tank. Large water basins, as required with conventional sprinkler systems, are not obligatory. This makes water mist systems an interesting option particularly for retrofits.

SYSTEM SET-UP

High-pressure water mist systems mainly consist of a pressure make-up device, a high-pressure piping, and special nozzles.

The required operating pressure is generated by means of high-pressure pumps or pressure cylinder systems. The selection depends on the surface to be protected and on the amount of water required. Pumps normally protect larger areas such as hotels, offices or archives.

WATER MIST PUMP SYSTEM (FOGTEC)

Due to the small flow rates required; pipes can be sized to diameters of only 10 to max. 40 millimeters. Pipe arrangement is not dependent on the gradient, dry and wet piping is possible. These properties permit installations in confined locations and for retrofits.

The system can be triggered either by a separate detection system or by thermally activated glass bulbs. Room heights of max. Five meters can be covered with one layer of nozzles installed in the ceiling. Higher areas, e.g. an atrium, can be protected by installing additional nozzles in different levels, where surfaces have to be cooled. Beyond this, it is possible to install wall cabinets with water mist extinguishing guns. They offer the possibility of rapidly suppressing initial fires, again with the lowest possible consumption of water.

SYSTEM ADVANTAGES

Public areas such as office buildings, shopping centers, movie theatres, restaurants and other comparable spaces including hotels usually accommodate people and a mixture of materials with relatively high heat release rates, like paper, plastics etc. People in the area often are not familiar with escape ways, increasing the risk potential in case of a fire.

Due to the extinguishing properties of high-pressure water mist, the heat radiation is effectively shielded, allowing people in the area to find escape ways and enabling trained personnel to rescue people caught in the area.

Water mist systems have numerous advantages over conventional sprinkler systems. Particularly the low water consumption should be mentioned. A break tank is sufficient for most systems, if the water supply source is reliable. When a system is activated, the break tank is being supplied from the municipal water system. No storing of water in sprinkler tanks is required. Soil contamination by flowing off extinguishing water is reduced to a minimum. Also in buildings, water damages are comparatively small even after extended fire fighting and particularly when a false alarm releases the system. This may be of crucial importance for high-tech areas such as EDP-rooms, laboratories, archives, as well as for heritage buildings.

PROTECTION OF THE STRUCTURE OF THE BUILDING

Especially when the structure of a building consists to a large extent of steel and glass, the cooling ability of water mist systems are of great benefit. Structural fire protection with its connected costs often can be reduced dramatically because the expected resulting heat of a fire will be reduced much more efficient compared to conventional systems.

EASY RETROFITTING

Due to the small pipe sizes required by these systems, retrofits can be carried out much easier even in special buildings such as historic sites. Pipe sizes are so small that the installation of these is even possible in false floors in the level above the protected level, thus making false ceilings unnecessary.

CASE STUDY

High-pressure water mist extinguishing systems are already used worldwide. Impressive fire-fighting results in real fires justify the investment costs, which may partly be higher in comparison to conventional sprinkler systems.

In hotel applications guest rooms as well as other accommodation areas, like restaurants, corridors and lobby areas, have been protected with high-pressure water mist systems.

PROTECTION OF GLASS AND STEEL STRUCTURE OF AN OFFICE BUILDING

One example for an office building where water mist technology has brought substantial benefits is the shown office building. The breathtaking 44 meters high building of steel and glass with 15 floor levels has completely been protected with a high-pressure water mist system of the FOGTEC type. The challenge was to elaborate an innovative fire protection concept, which takes into account the extraordinary design and requirements of the structure of the building, at the same time supporting the architectural concept without any

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Pic courtesy of FOGTEC GmbH

structural or optical restrictions.

The building incorporates office and lecture areas, IT floors and consists almost completely of glass and steel facades. Some escape routes are exposed to heat and smoke of a potential fire and necessitate effective means of smoke washing and cooling.

Due to the flexibility required no fixed fire zones could be defined. Further, the open glass and steel structure demands compensation measures. This resulted into the requirement for an automatic extinguishing system by the local fire department.

Based on the results of tests independently carried out according to the light hazard test protocols and specific structural cooling tests, the authorities having jurisdiction involved approved the high-pressure water mist technology as the most suitable for the risk, mainly due to the high cooling and smoke washing abilities.

Additionally, the architect was in favor for the system, since it permitted an installation with small-bore pipe work into a false floor, using minimal space and not affecting the open ceiling structure.

The advantages of water mist systems have brought up for both the end user and for architects many opportunities for office projects, where this new technology is the most suitable and efficient for the fire risk.

PROTECTION OF A HERITAGE BUILDING

All office and lecture areas were protected with glass bulb activated nozzles, the escape routes in the atrium of the building were protected with and open type nozzle. Spacing between nozzles is very comparable to the ones of conventional sprinkler systems.

In this particular case large areas in the atrium are protected with an open type nozzle, grouped into sections. All water supply equipment was accommodated into a 19m^2 area in the basement. A conventional sprinkler system would at least have required twice the floor area to fit all necessary water supply units, not even mentioning the water storage facilities.

Due to the enormous cooling effect of water mist, the requirements for structural fire protection could be reduced based on specific fire tests carried out in conjunction with an independent research institute. The higher initial investment into the water mist technology compared to a conventional sprinkler system therefore immediately paid out with savings on the structural fire protection. This could not have been achieved with conventional sprinkler technology.

CONCLUSION

High-pressure water mist extinguishing systems have been proven to be an interesting alternative to conventional sprinkler systems, even if the initial investment costs may partly be higher.

The advantages of water mist systems have brought up for both the end user and for architects many opportunities for office projects, where this new technology is the most suitable and efficient for the fire risk.

At present large project still can only be designed by water mist system manufacturers according to full scale fire test results, but in future these designs will be available to engineering offices and architects, enabling them to specify such beneficial technology for numerous prestigious projects.

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IWMA International Water Mist Association

3rd International Water Mist Conference

Due to the current situation in the world, it was decided to postpone the International Water Mist Conference to September 22–24, 2003. Interested parties should browse our web page www.iwma.net in order to get information about venue and accommodation, call for papers and registration material.

Although a number of abstracts for presentation at this conference were already submitted, it is still possible to send in interesting abstracts.

General topics are:

System Applications

Solutions for mass transportation systems, traffic tunnels, office buildings, hotels, archives and galleries, storage and sales areas, health care facilities, industrial processes and other new applications where water mist has been found to be a cost effective replacement for Halon and sprinkler systems.

Regulations, Standards and Codes

Assessment of currently available regulations, planned standards and changes to standards, including gaps in regulations and further needs.

Research & Testing

Small and large scale testing, suppression technologies, spray characteristics, advantages/disadvantages of water mist systems, comparison to other fire-fighting methods, CFD Modeling and research needs in the future.

Environmental and Health/Safety Issues

Overview of water mist from the standpoint of health authorities. Discussions on the importance of the use of water mist as a tool in reducing the ozone layer problems posed by Halons.

Educational Seminar for North America – May 16, Dallas, USA

The International Water Mist Association and the National Fire Protection Association (NFPA) will conduct a one-day Joint Technical Symposium on Water Mist Fire Protection Systems on May 16, 2003, in Dallas, USA. It will be held in conjunction with the NFPA World Congress and Exhibition.

Members of the IWMA and other experts in this field will, in a number of presentations, explain the basic theoretical and functional characteristics of water mist and the wide range of possible applications as well as the current situation concerning codes and standards.

The seminar is designed for architects, consultants, fire protection engineers, end users and others who are not so familiar with water mist technology yet.

The IWMA web page provides further information regarding this seminar. Please browse the "News & Acts" section.

Work Shop from February 24–27, 2003, in Mobile, USA – A brief Review

The Naval Research Laboratory, in conjunction with the Colorado School of Mines, the International Water Mist Association, and Hughes Associates, Inc., held a Workshop on Fire Suppression Technologies from February 24–27, 2003, in Mobile, Alabama, USA. 140 participants from 7 countries attended this symposium. The participation underlined the high interest in water mist technology for fire suppression in North America. Particularly real fire test demonstrations on an ex US war ship (USS *SHADWELL*) were found to be very interesting by the attendees of the workshop.

IMO FP 47 Meeting 2003

The FP 47 meeting took place during the second week in February in London, USA. The results of the last meeting have implications for water mist technology also. A comprehensive report, written by Robert Wickham, member of the IWMA Board of Directors, can be downloaded from the IWMA web page. Interested parties should browse the "Download" section of our home page.

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Economics of Fire

By Mr David W. Clark, Rolf Jensen & Associates, Inc.

IT IS EASY TO SHOP FOR A CAN OF SOUP. It's a tangible, known commodity. The price differences among cans of soup is small and the final result is, well, canned soup. Shopping for fire protection and life safety services and systems it not as easy. How to spend your project or operating budget may not be so obvious. Be it design, installation or maintenance, the economics of fire protection takes on a whole new flavor!

There are many reasons to provide buildings and processes with fire protection and life safety systems. Compliance with codes and regulations is an obvious one since it is often a prerequisite to operating a business or occupying a building. The need to obtain insurance will often require the facility and operations to conform to fire protection standards as well. While the tendency is to drill down into the line item costs for these systems, it is important to keep the big picture in mind. What is the value of what you are protecting . . . be it facilities, equipment, operations, human life, or a commodity such as cans of soup? Where might you spend money today to save money tomorrow? It's not enough to know what the cost is, you also have to know what the cost of 'not' is.

A CODE COMPLIANT DESIGN

An established goal of many design projects is to achieve compliance with codes and standards. Other design projects don't establish this as a goal, but arrive at a code compliant design anyway. In either scenario, a compliant design may not be enough. Questions that must be asked early in the programming and concept phase include:

1. What is the minimum design criterion for the project?
2. Does the minimum design criterion provide the level of protection desired?

Answering the first question seems to be necessary for any project at its inception. How else could a project be designed? Project planning should identify the applicable codes adopted by building and fire officials as published by organizations such as the International Codes Council Inc., i.e. the *International Building Code* (IBC), *International Mechanical Code* (IMC), *International Fire Code* (IFC), etc., and the National Fire Protection Association (NFPA), i.e. NFPA 101, *The Life Safety Code* (LSC), NFPA 70, *The National Electric Code* (NEC), etc. This research should also identify any criteria from government organizations where agency specific design guidance is applicable, as well as any insurance carrier criteria. This project diligence should document the appropriate editions of, and any modifications or amendments to, the criteria. Although compiling the codes and standards applicable to a project seems like an obvious task, it is not a task that is always completed. And it doesn't end there.

Where might you spend money today to save money tomorrow? It's not enough to know what the cost is, you also have to know what the cost of 'not' is.

Knowing the applicable codes must be translated into an appreciation of what requirements will be imposed, and thus the resulting level of fire protection and life safety to be established. Whereas the requirements for small or simple projects may be summarized verbally, large or complex projects might require a documented basis of design or code summary. Knowing the requirements of the minimum design criteria is necessary to answer the second question above. Whereas the 'yes or no' question might easily be answered, it might also require a discussion regarding the need for protection beyond the criteria mandate. The discussion needs to include the owner or owner's agent and design team members that can communicate the protection that would be afforded via a design that is per the minimum code requirements. This intermediate step should consider risk factors that encompass life safety aspects, equipment replacement costs, and business interruption costs.

For example, there are many facilities classified as Business Occupancies per building and fire codes including air traffic control towers and barbershops, research laboratories and car washes. An air traffic control tower serves a vital public safety function and warrants a level of protection greater than a barbershop. A research laboratory could have 'one-of-a-kind equipment' whose value isn't adequately protected via the code minimum requirements applicable for a car wash. The air traffic control tower might not be able to tolerate any business interruption and the resulting revenue loss by commercial airline carriers; similarly a business interruption at the research laboratory might endanger a critical experiment.

Protection

> *Someone has to pay for the cost of hourly wages and schedule slippage. Although harder to calculate, the hidden burden of a tarnished reputation can be even more costly in the long run.*

In these instances, the additional expense of fire protection and life safety features and systems is an acceptable and incremental cost. The potential cost of not providing fire protection and life safety beyond the mandated minimum could be too great.

And what if the exercise determines that the code minimum requirements afford an appropriate level of protection? What if you are looking to design and build a barbershop or car wash? What benefit does the exercise described above provide if there are no life safety, equipment or operation considerations that influence a greater level of protection than prescribed? Knowing design expectations will assist in the preparation of documents that meet the needs of reviewers. Getting the design permitted without comments avoids the expense of rework and resubmission. Rework sometimes includes revising the design per the minimum design criteria, which may only impact a single drawing and discipline. Other times, the design committed to on paper cannot be easily pushed to a prescriptively code compliant solution. The 11th-hour fix often requires additional design features to accomplish the intent of the criteria. The 11th-hour fix might even include an engineering study to establish that an equivalency or performance based design is achieved. Unscheduled meetings will often accompany the rework and resubmittal process. Someone has to pay for the cost of hourly wages and schedule slippage. Although harder to calculate, the hidden burden of a tarnished reputation can be even more costly in the long run.

How else might the effort of providing a basis of design or code summary be advantageous to a project? Money spent early can help assure that only equipment that is required and appropriate for the level of protection will be specified. For example, the mere presence of a computer room with a raised floor might be enough for some owners, designers or authorities having jurisdiction to invoke special computer room criteria as found in NFPA 75, *Electronic Computer/Data Processing Equipment*. NFPA 75 includes requirements for separation by fire resistance rated construction and fire detection and suppression, i.e. sprinklers or a gaseous total flooding extinguishing system. But NFPA 75 is written to be an elective standard whose application is based on risk considerations as described above. Given a 'nothing special' computer room, the expense of unnecessary fire protection features and system can be avoided.

As designs progress, the code summary can be used to help ensure that fire protection and life safety features aren't over-designed. For instance, when asked why all of the janitor's closets were separated by fire resistance rated construction on a fully sprinklered church facility, the designer stated 'because we always rate them'. The building code held no such requirement. When asked why all the ductwork penetrations of fire rated barriers were provided with fire or fire and smoke dampers, the designer stated 'because you have to put a damper in a fire barrier'. The mechanical code and air-conditioning and ventilating system standard only required fire dampers in 2-hour barriers. In a large manufacturing facility, the authority having jurisdiction was requiring the owner to provide duct smoke detectors at through-roof heating and ventilation units based on their respective capacities. Presenting the code requirements and commentary from a code handbook convinced the fire marshal that the duct smoke detectors were not required, resulting in an immediate savings of over $100,000. Having knowledge of the applicable codes and their requirements can keep the focus on providing what is needed – where it is needed.

AT THE CONSTRUCTION SITE

The construction process is where the owner's desires and designers' intents are turned into reality. From bare earth, structure grows and systems are installed until finally the building becomes habitable. The fire protection and life safety features and systems may be perceived as only a small component of the project. They may be recognized as integral element of the completed facility. In any event, know that the economics of fire protection doesn't end at design.

> *The construction process is where the owner's desires and designers' intents are turned into reality. From bare earth, structure grows and systems are installed until finally the building becomes habitable.*

Economics of Fire Protection

It is common in the construction process for the fire protection contractor to submit equipment and materials that are deemed adequate for the installation, although not meeting the specification requirements. The contractor may or may not be aware that the submitted equipment does not meet the details of the specification, rather that the equipment submitted meets code requirements. In some instances, it might be appropriate for the engineer of record to review the submittal and approve the equipment and materials as a change to the design. New technology often offers a level of performance that meets the design intent if not the specification details. The change to the requirements of the design must be documented. If not already provided, it is also appropriate to request pricing information in a detailed enough format to identify credits to the project. This can result in an installation that provides the advantages of new technology at a lower cost.

On the other hand, it might not be appropriate to accept a fire protection submittal that offers equipment and technology that differs from the specifications. Even where the offering is new technology at a lower cost, selection based on this value could jeopardize the larger goals established for the project. Recall that designs exceeding code might be deemed appropriate per the risk based decisions regarding life safety, property or equipment protection, or business interruption concerns. The decision process and resulting project goals are probably not being communicated to the contractor. Therefore the need for equipment that exceeds the code minimum performance requirements might to be known to the contractor.

Once again, the economics of fire protection could warrant an expenditure that is not typically incurred. Specifically, the fire protection and life safety engineer could be present at the pre-bid and pre-construction meetings to discuss the fire protection and life safety features. The fire protection and life safety engineer should be reviewing equipment and material submittals, and also be involved in related change order and credits discussions.

MAINTENANCE AND OPERATIONS

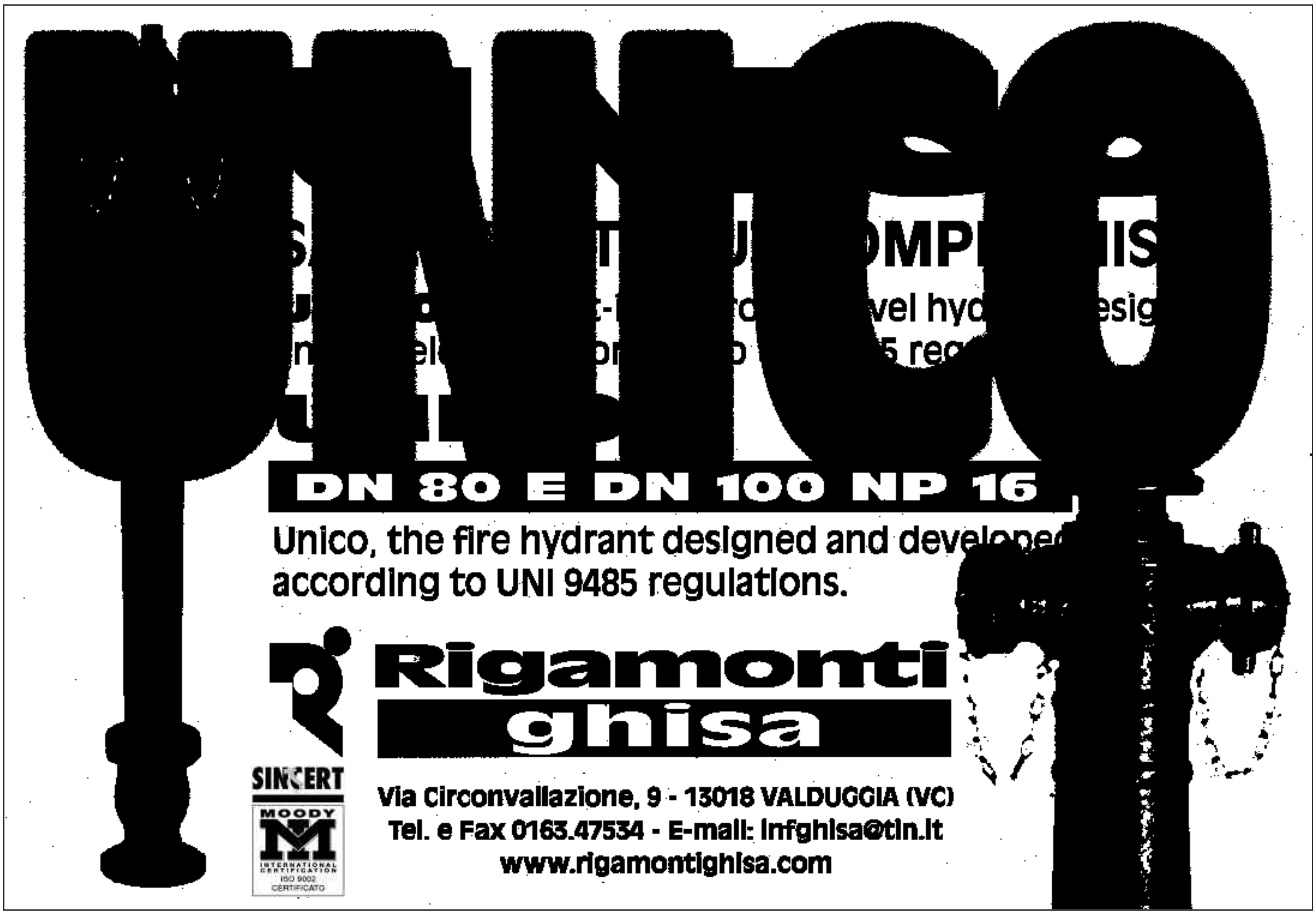
The maintenance of fire protection and life safety systems will be required by codes and standards. NFPA 25, *Standard for Inspection, Testing, and Maintenance of Water-Based fire Protection Systems*, will establish various tasks for fire sprinkler, fire pump, standpipes, and other fire protection systems. Similarly, NFPA 72, *National Fire Alarm Code*, identifies inspection, testing and maintenance tasks for fire alarm systems. Other NFPA publications will also identify maintenance activities, as well as manufacturer specific and insurance requirements. The inspection, testing and maintenance tasks will be called out for frequencies that range from daily to annual and greater.

Many of the maintenance activities require expertise and specialized equipment that will be best provided from a contractor. Other tasks might well be worth doing with in-house personnel. NFPA 72 for example provides guidance beyond what the inspection task is but how to perform the task. Obtaining complete documentation of the installed system at project completion to include operation and maintenance manuals and accurate as-built drawings will facilitate these efforts. Having the foresight to include delivery of the codes and standards that were used for the design and that contain the inspection, testing and maintenance activities at project completion may be an incremental project cost that pays for itself in short order. Ensuring that system training at equipment acceptance goes beyond operation and into maintenance activities could prove equally valuable. Involving the design engineer in the set-up and organization of a preventative-maintenance card system could be an expense that pays for itself when contractor services can be reduced. Even if there is no intent or desire to perform fire protection and life safety maintenance tasks in-house, knowledge of the requirements will assist in the oversight of hired vendors. Making sure that you're paying for what is needed and that the service provided is what was paid for makes good economic sense.

In the end, the economics of fire protection takes on many shapes and forms. It is sometimes wise to pay for services beyond the role of system designer. Spending project resources in up-front diligence can provide benefits later in the process, even when defending the decision may be complicated because of difficulties in quantifying the unknown. Oh yeah, back to the soup. Just as a simple broth can benefit from a pinch of salt, a fire protection project can benefit from a small dose of attention. In cases where the fire protection and life safety concerns more resemble a main course than an appetizer, it is certainly wise to make sure that someone is keeping an eye on it to prevent boil-over. It is not only wise; it is good fire protection economics!

Many of the maintenance activities require expertise and specialized equipment that will be best provided from a contractor. Other tasks might well be worth doing with in-house personnel.

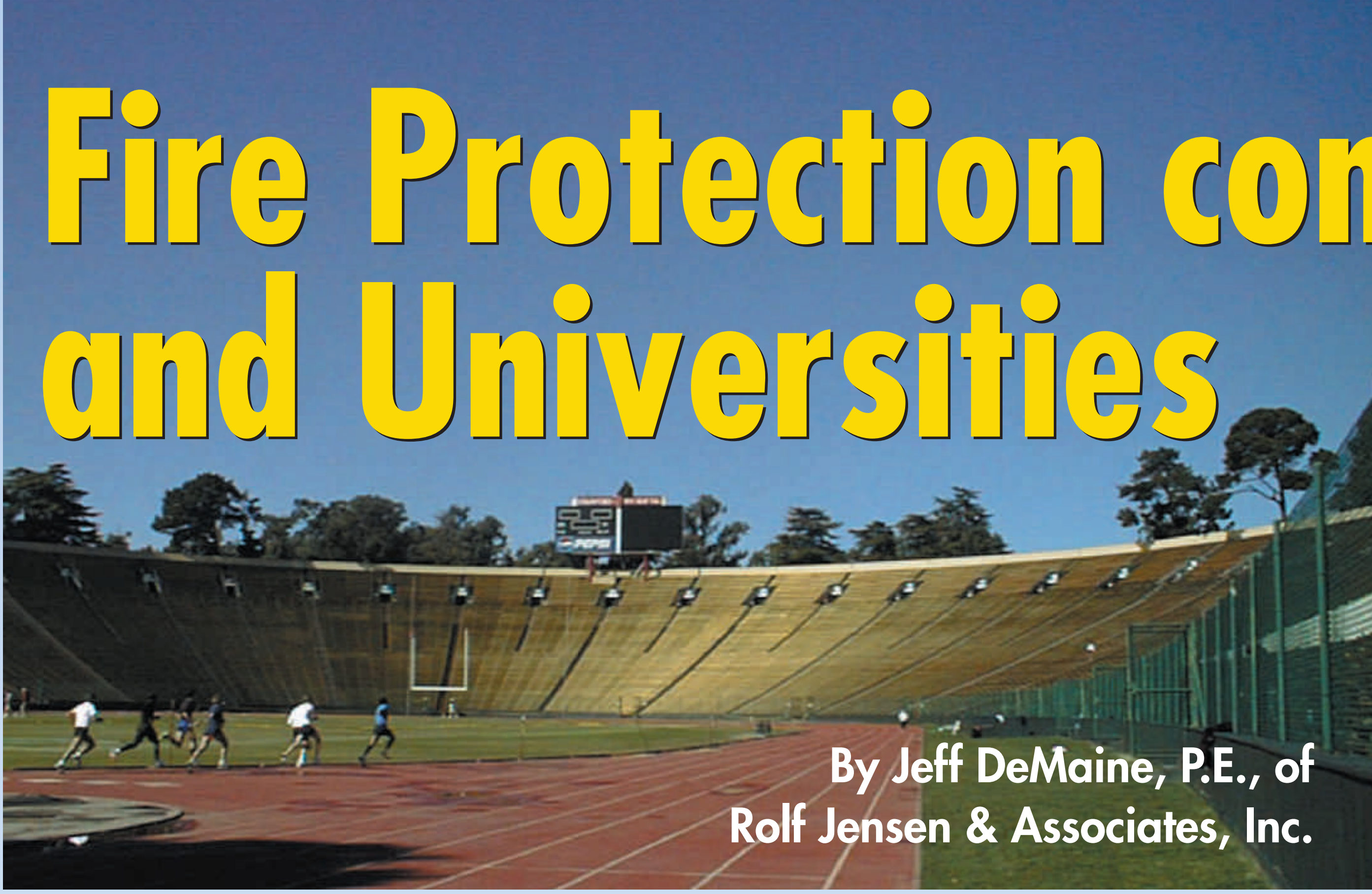
Mr David Clark is a consulting engineer with Rolf Jensen & Associates, Inc. (RJA), fire protection engineering consultants. Located in the RJA Atlanta office, Mr. Clark holds a degree in Fire Protection Engineering from the University of Maryland. To learn more about RJA, visit their website at www.rjagroup.com.



Enquiries: infghisa@tin.it

Enquiries: sales@controlvalves.com

Fire Protection conc and Universities



By Jeff DeMaine, P.E., of Rolf Jensen & Associates, Inc.

University Campus. *Pic courtesy of RJA Group*

UNIVERSITIES AND LARGE INSTITUTIONS offer various and far reaching opportunities to their students and occupants. This ranges from multiple courses of study to sporting events to political involvement. However, in providing this array of opportunities, there are many fire protection concerns related to this diversity. These concerns include fire alarm compatibility, sprinkler controls, needs for special suppression, maintenance of fire barriers, fire alarm and sprinkler systems, and the integration with other systems.

The major driving force for requiring these systems is typically the building and fire codes. Due to the plethora of codes and standards in use just in the United States, the following dialogue will focus on the National Fire Protection Association's (NFPA) Building Code (NFPA 5000) and Fire Prevention Code (NFPA 1).

Occupancy diversity

As with any large institution, the interest of the student population varies from athletics to academics to social. To satisfy the existing students and attract new students, colleges and universities must provide a far ranging breath of facilities. Some examples of the occupancies at a large university include:

Use	Occupancy per NFPA
Classrooms	Assembly, Business
Laboratories	Business, Hazardous Materials
Campus Centers	Assembly, Business
Gymnasiums, Fitness Center	Assembly, Business, Storage
Arenas	Assembly, Business
Libraries	Assembly, Business, Storage
Dormitories	Residential, Storage
Physical Plant / Maintenance	Storage, Business
University Teaching Hospitals	Healthcare, Business, Storage, Assembly

There are many buildings that are not single occupancy buildings. Many functions of student life and academics are intermingled such that classroom buildings include teachers' offices and gymnasiums contain the athletic department's offices. Each occupancy brings with it specific requirements that must be followed.

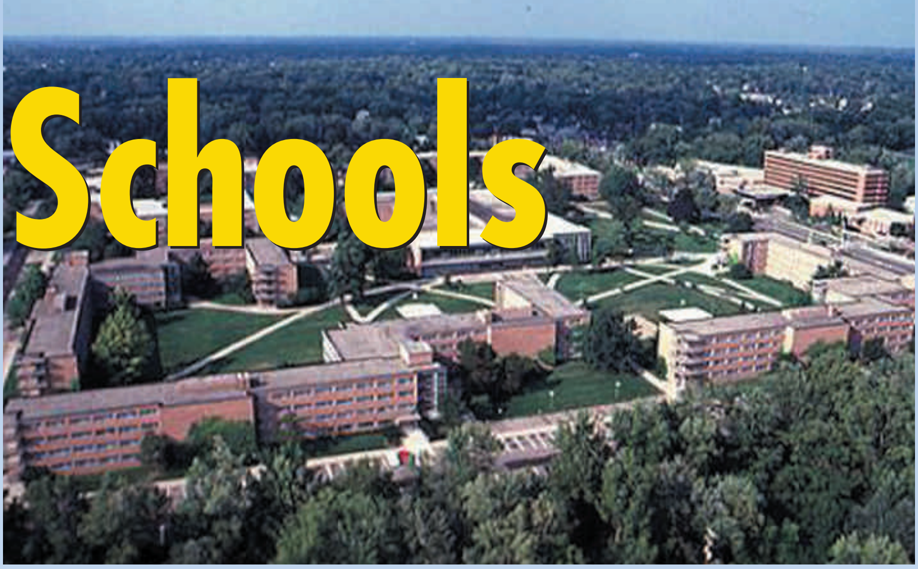
Building Systems and compatibility

University buildings are no different than other commercial buildings when dealing with fire protection systems. Fire protection systems are considered emergency systems, where the majority of the buildings systems are used day-in day-out. Therefore, general objectives of the building's systems may conflict with the objectives of the fire protection systems. There are several examples such as:

Conflict: The Heating, Ventilation, and Air Conditioning system is designed to maintain a comfortable environment throughout the building in an efficient manor, while the fire protection systems, namely the fire barriers, are required to prevent fire and smoke spread during an emergency.

Reasoning: The efficiency will have to drop if dampers are introduced to the ductwork system or multiple fans would be required on every floor to increase efficiency.

erns at Schools



Pic courtesy of RJA Group

Conflict: The need for security during the normal working day to keep unwanted people out of spaces in the building versus the need to egress occupants quickly during a fire emergency.

Reasoning: Some areas of the building may not be as secure as the building owner would like to provide a safe efficient path of travel to the exterior of the building.

Conflict: The building owners do not want to evacuate the building if the fire alarm is reporting a false alarm.

Reasoning: The owners are attempting to prevent unsatisfied occupants.

The design of the building creates major issues based on the requirements of the systems involved. All these issues would ideally be solved by the design team, possibly consisting of architect, mechanical/electrical/plumbing engineer, fire protection consultant, and security consultant.

Integration as campus system

Since most colleges and universities were not built in a day, the age and design of each building varies. As with most construction, each building may also be different than the neighboring building. This variance between buildings may include construction type, as well as the operational and safety systems within.

The facilities department of the University is typically the oversight for the buildings after construction. To maintain constant supervision of the buildings, they are monitored from a central location. Can you see where this is going? Multiple buildings, each with a slightly different fire alarm system, having to report back to a central monitoring point. Even with a single fire alarm manufacturer, each company has several models to choose from and not all systems can be networked together. Not coordinating the fire alarm as a campus may cause issues with maintenance and upkeep which will be discussed later.

There are several other systems located in typical college buildings. These include automatic fire sprinkler systems, specialty systems (smoke control and special fire suppression systems), and passive fire protection systems (egress systems and fire barrier/compartmentation). Each system requires forethought to prevent future problems related to system compatibility.

As you can see from the general examples above, there is no universal approach to integration of systems as a campus. Each campus is different and must be looked at as unique.

Integration with security

Security has become a major concern at colleges and university lately. Even the smallest of colleges must ensure the safety and security of people using the buildings. In addition, security is not only provided to keep the "unwanteds" out, but several times, it is provided to keep possessions in, such as research laboratories and museums.

The protection of its occupants from the unwanted intruders is typically provided with devices on the outside of the building to prevent entry. This does not usually pose a conflict with emergency egress, since the doors are locked from the exterior not the interior. Dormitories are the prime example of this type of security. Security for dormitories is configured to only allow occupants with the required "key" to enter the building.

Protection of possessions poses a separate problem. This approach aims to prevent any valuable items from leaving the building. The locking of doors will prevent occupants from egressing the building during a fire emergency. In addition, the locked door will also prevent occupants from escaping a non-fire emergency, such as a physical assault within the building. The balance between security and access/egress poses problems that need to be dealt with during both the design process and during the life of the building.

Responsibility for upkeep/maintenance

Building and design of a campus building only accounts for a small portion of the overall lifespan of the building. Upkeep and maintenance of the building and building's systems is where the bulk of the effort lies. Maintenance of the fire alarm system, sprinkler system, and fire barriers is a full time activity. In addition, the building is required to be maintained in accordance with the building and fire code under which it is was designed. Therefore, not only does the building manager need to be knowledgeable with the systems that are installed, but also the codes under which it was installed. And with typical campuses, every building may have been constructed in a different year.

The most labor-intensive upkeep and maintenance is on the fire resistance barriers. These barriers are continuously being penetrated year after year. New telephone and data wires are brought in

Security has become a major concern at colleges and university lately. Even the smallest of colleges must ensure the safety and security of people using the buildings.

Pic courtesy of RJA Group

With most campuses located in a city, open space to building new buildings is not readily available or affordable. Renovation/addition is therefore an option.

every year to older buildings. These penetrations must be addressed, but usually are the last on the punch list and are typically ignored of forgotten.

There are other potential problems that are inherent with maintenance of older buildings, such as getting parts for older systems. The fire alarm system is typically one of the systems that present these problems. Fire alarm manufacturers are continually changing and upgrading their systems. Every year manufacturers discontinue models and stop storing parts. Each year this fire alarm becomes more and more expensive to maintain. With this said, usually the average lifespan of a fire alarm system is much less than the lifespan of the building it is installed in.

One system that does not have much maintenance and upkeep associated with it would be the sprinkler system. Normal systems are basically maintenance free. The system is required to be inspected quarterly and yearly, but not much maintenance is involved.

With all the maintenance required, the facilities department must be provided with the necessary tools to provide this maintenance. The tools include regular education for the intricacies of the code, training for the proper use of penetration protection systems, and enough manpower to implement the maintenance. Because of the intensive labor, much of the maintenance is deferred or farmed out to contractors. However, it should not be overlooked.

Renovations/additions

One of the last concerns for university buildings are renovations/additions. With most campuses located in a city, open space to building new buildings is not readily available or affordable. Renovation/addition is therefore an option. With the renovation/addition, come several issues that range from code compliance of non-renovated portions to maintaining the existing building during the project.

Code compliance of non-renovated portions is one of the biggest issues that design teams are required to face. Renovating a building that has no chance of complying with the current code, however, being required to make the new construction comply causes several code compliance issues. Issues include: construction type deficiencies in changes of the building use, egress insufficiencies due to using open stairs, or a change in use, and fire alarm upgrades that don't incorporate the entire building.

One of the consistent fire alarm system issues to address is accessibility compliance. Older editions of the Fire Alarm Code (NFPA 72) permitted non-accessible compliance devices such as chimes, flashing lights and manual pull stations that are mounted above the new required height. In a large renovation, the entire building is usually required to be evaluated for code compliance issues. The first system to get looked at is usually the fire alarm system, which in turn make the designer extend his project area to include non-renovated spaces.

Another system that is highly scrutinized is the sprinkler system. Additions and renovations may create a deficiency in the sprinkler system. The deficiency is usually based on the pressure and amount of water available. If a building was originally built without a fire pump and a new high hazard space is being designed into a building, such as a laboratory, the water supply may not be sufficient for the building.

Pic courtesy of RJA Group

Conclusions

As can be seen with university buildings, there are several concerns that must be addressed during the lifespan of the building. In the design stage, issues with compatibility of the existing campus system must be addressed along with the security aspects of the building. In the midyears of the use of the building, maintenance of the fire alarm systems and fire barriers become the concern to deal with. Then, in the later years of its existence, renovation and addition problems will be focus. As with all of the problems and concerns, the team of individuals used will make the difference. Having the right focus and expertise on the fire, life safety, and security issues will allow more innovative buildings that can grow with time and meet the needs of the university for years to come.

Mr. Jeffrey DeMaine, P.E. is a consulting engineer with the Boston office of Rolf Jensen & Associates, Inc. (RJA). RJA provides fire protection, life safety, code consulting and accessibility engineering services. RJA has 18 offices around the United States and strategic business alliances around the world. To learn more about RJA, visit www.rjagroup.com.

FIRE & SMOKE DETECTION EQUIPMENT *ROUND UP*

Here set out in an easy alphabetical format is the latest in our fire protection equipment roundups. This time we have given the leading manufacturers of fire and smoke detection and associated equipment a chance to present their latest product releases. This round up will make a good reference guide for the future. So keep it safe. You will find full contact details below every editorial, so go on dive in and get in touch !!!

AMPAC

Ampac designs, manufactures and distributes a range of technologically advanced Fire Detection and Emergency Warning Systems for commercial, industrial, and multi-residential complexes. *Our aim is to provide 'CONSISTENTLY EXCELLENT SERVICE' in the eyes of our customers.* This statement not only drives our design process to ensure we are providing products that are highly regarded for their modular simplicity, ease of use and reduced installation and maintenance costs, it also drives us to provide a level of sales and technical support that is tailored to the individual customer's requirements. To find out more contact your nearest Customer Service Office:

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EST

Edwards Systems Technology (EST) is a world leader in innovative life safety solutions for commercial and industrial applications. Our extensive product range includes small, stand-alone fire alarm panels, conventional detectors, multi-sensor detection, signalling solutions, nursecall communications and large integrated, fire, access control and security systems. EST International exports life safety systems to more than 180 distributors in 65 countries around the world. For additional information, and to find the office nearest you, please visit www.estinternational.com. EST will be exhibiting at International Fire Expo in Birmingham and NFPA in Dallas.

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FIRE FIGHTING ENTERPRISES LIMITED

Show launch for "easy reach" beam detector

Fire Fighting Enterprises will unveil a new version of Fireray Reflective, its infrared beam smoke detector for large interior spaces, which will simplify

routine function testing. To avoid the lengthy process of accessing detectors installed at height, an optional low-level controller allows alarm functions to be checked from a convenient location via a simple key switch. A serial port on the controller allows the detector's output signal to be checked using a laptop computer, and long-term diagnostic checking is possible if a datalogger is used.

Fireray Reflective is an innovative "all-in-one" unit combining an infrared transmitter and receiver in a single housing. Designed to reduce cabling costs in premises containing primarily non-reflective surfaces, it will be joined at the show by Fireray 2000, FFE's "two-head" beam detector for buildings of all types.

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HOCHIKI EUROPE (U.K.) LIMITED

Hochiki Premieres New Generation Detector Range at FireExpo

At International Fire Expo 2003 on Stand B50 (19–22 May), at Birmingham's NEC, **Hochiki** launches a New Generation cost-effective Conventional Detector Range. This innovative product range utilises Hochiki's well-proven 'flat-response' technology for the new photo-electric smoke detector which has already been extensively used in the field through the ASX and CDX ranges, removing the need for ionisation smoke detectors thus reducing environmental impact. The new range is tested to EN54 2000 which is the new European standard, and key features include:

- Suitable for use on both fire and security systems
- Environmentally friendly photo-electric smoke detector
- Backward compatibility – new heads can be fitted to existing CDX bases
- Integral Remote Indicator Drive on all base variants
- Unified product range featuring same flexibility as previous CDX range
- Simplified range of bases including Head Removal and Relay bases

Stand B50 will be the essential source for professional fire alarm system specifiers and installers wanting to see the latest fire safety developments. Hochiki's ESP range of products includes a full range of smoke and heat sensors with unwanted-alarm reduction capabilities and fully featured Input/Output modules. Also on display will be Hochiki's conventional range which includes solutions for special applications.

Hochiki designs and manufactures to ISO9001, and products are approved to British and European standards by LPCB and others.

For more information please contact:
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Website: www.hochikieurope.com

KIDDE FIRE PROTECTION

Kidde Products

Kidde Fire Protection is at the forefront of fire detection technology. Two key products which will be on show at International Fire Expo will be the Hart XL High Sensitivity Smoke Detection system and the VegaNET Display System.

Hart XL incorporates laser-based particle counting technology, with on-site sensitivity adjustment from 0.0025%/metre to 1%/metre. Simple to install, commission and maintain, Hart XL comprises four basic sub-units, which provide complete flexibility in system configuration.

The VegaNET Display System has been developed to meet the requirements for fire detection systems for large buildings and complex sites. It is a PC Windows™ based application which enables the user to view an entire site enabling rapid identification of the source and extent of each event, particularly during multiple alarm conditions.

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Website: www.kfp.co.uk

MORLEY-IAS

The UK's leading multi-protocol fire control panel manufacturer

Morley-IAS is a leading manufacturer of high performance conventional and analogue addressable fire alarm control equipment and systems. Conventional panels range in size from one to eight

zones; intelligent panels are available as one loop stand-alone units or two or five loop networkable panels. All addressable models are compatible with the protocols of the major detector manufacturers such as Apollo, Hochiki, Nittan and System Sensor, enabling existing systems to be upgraded and new systems to be specified with whichever detector is preferred. In addition to the control panels themselves, a full system solution including multi-panel networks, graphical front-end solutions and a range of peripheral products can be engineered to suit specific applications.

For more information please contact:
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NOTIFIER FIRE SYSTEMS

ID²net provides robust distributed fire protection system

Notifier Fire Systems' ID²net Intelligent Digital Delivery Network sets new standards for response speed, reliability, robustness and flexibility. It is designed for medium to very large buildings or multiple building campuses such as hospitals, military establishments and shopping centres where thousands of detectors and I/O modules controlled by multiple fire panels are required. ID²net uses ARCnet-based multiple token-passing collision-free software to provide a robust peer to peer system with capacity of 100 nodes managing 32 networked ID3000 eight-loop fire alarm panels giving 50,688 addressable points and 8160 network zones. Intern-odal distances are up to 1700m over Standard or Enhanced copper cables as defined in BS5839-1 2002 or typically up to 5000m over fibre optic media.

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E-mail: david.spencer@notifier.ltd.uk
Website: www.notifier.ltd.uk

RAFIKI PROTECTION LTD

800 Devices on a Single Loop

The Sita 200 plus Addressable Fire Detection System, from **Rafiki Protection Ltd**, can accommodate up to 200 'Multipoint' multi-mode fire detectors with built-in sounder, isolator and I/O to provide an unparalleled 800 devices per loop. This unique approach, unmatched in the marketplace, provides significant cost savings for every application. The intelligent 'Multipoint' detector has 15 modes of operation, selectable from the panel, covering smoke, heat and combined sensing. This enables just one device to cater for all fire detection situations, a great advantage for design, stock holding and maintenance. With its built in isolator and I/O and optional full specification 92dbA sounder, the 'Multipoint' detector provides the system designer with unparalleled flexibility.

For more information please contact:
Rafiki Protection Ltd
55 Springvale Industrial Estate
Cwmbran
South Wales
NP44 5BD UK
Tel: 01633 865558
Fax: 01633 866656
E-mail: sales@2wire.co.uk
Website: www.rafiki.biz

SECURITON AG

Fire Detection Technology from Securiton Switzerland

Securiton, based in Switzerland, develops and manufactures a large range of different fire detection systems to fulfill broad customers' needs.

For the detection of smoke, heat or flames, a variety of detection technologies have been developed to ensure efficient alarm release in dangerous situations. Combined with the most advanced fire alarm system software, the functionality of Securiton fire alarm systems know no limits when challenged by customer requirements.

Securiton offers fire alarm systems based on line-type heat detection, aspiration smoke detection systems and video picture based fire- and smoke detection. Combined with Securiton fire alarm control panels, very complex functionalities are programmable, to provide unique customer benefits.

For more information please contact:
Securiton AG
Alarm and Security Systems
International Operations
Alpenstrasse 20
CH-3052 Zollikofen/Berne
Switzerland
Tel: +41 31 910 11 22
Fax: +41 31 911 25 32
Website: www.securiton.ch

SILENT KNIGHT DEBUTS 50 POINT ADDRESSABLE FACP

Silent Knight introduces the IntelliKnight Model 5700, a 50 point class leading single loop addressable fire alarm control/communicator system

SILENT KNIGHT
A Honeywell Company

that provides you with the revolutionary value and performance of addressable sensing technology combined with exclusive, built-in digital communication, distributed intelligent power, and easy to use interface. Powerful features such as drift compensation and maintenance alert are delivered to this powerful FACP from Silent Knight.

For more information please contact:
Silent Knight
7550 Meridian Circle
Maple Grove
MN55369-4927
USA
Tel: +1 612 493 6400
Fax: +1 612 493 6475
Website: www.silentknight.com

SPECTREX INC.

Spectrex has just added two new **SharpEye Flame Detectors**, both based on their innovative triple infrared (IR^3) technology and ATEX approvals.

SharpEye 20/20**XI** includes heated window, to eliminate ice and snow; rugged stainless steel, EExde(ia) enclosure; integral, segregated EExe terminal section to avoid exposure of the internals during installation. A data port allows field configuration and status interrogation.

SharpEye 20/20**MI**, a new low-power model, has a very compact, lightweight, stainless steel design for general use or EExia approved with an optional plastic enclosure for semiconductor wet bench applications.

Both carry a 3-year warranty and detect flames over distances up to 40 (MI) or 60 (XI) meters.

For more information please contact:
Spectrex Inc.
218 Little Falls Road
Cedar Grove
NJ 07009 USA
1-800-452-2107 (toll-free in the USA)
1-973-239-8398 (tel.)
1-973-239-7614 (fax)
E-mail: spectrex@spectrex-inc.com
Website: www.spectrex-inc.com

SYSTEM SENSOR EUROPE

Modules for addressable fire systems from System Sensor

Modules are critical components within any addressable fire system, enabling the panel to monitor and control a wide variety of ancillary components and functions. **System Sensor Europe** has introduced the new M200 Series. All individual modules can be mounted in a stand-alone enclosure or on a standard 35mm DIN rail; also available are multiple input and output modules providing either six or ten individual modules on a single PCB, designed for use in more complex installations where numerous single modules are required. In addition to low voltage 24V units, the M200-240 modules can control mains-powered devices rated at up to 5A @ 240VAC.

For more information please contact:
Stuart Davies
European Marketing Manager
System Sensor Europe
3 Horsham Gates
North Street
Horsham
RH13 5PJ
Tel: + 44 (0)1403 276500
Fax: + 44 (0)1403 276501
E-mail: sales@sseuk.com
Website: www.systemsensoreurope.com

VISION FIRE & SECURITY

VESDA has become synonymous with high-performance aspirating smoke detection, while Vision Fire & Security – manufacturer of VESDA – is established as a market leader for its expertise in very early smoke detection.

There are now numerous products within the VESDA portfolio, all of which are designed to provide active detection in a wide range of environments. Newest to the range is VESDA Exd, specifically designed for hazardous areas.

Vision Fire & Security is a member of the Vision Systems Group, which was launched in Australia in 1984 and now has annual growth rates exceeding 35 per cent.

For more information please contact:
Zsuzsanna Csuthi/Samantha Verrall
Vision Fire & Security
Vision House
Focus 31
Mark Road
Hemel Hempstead
Hertfordshire HP2 3BW
Tel: +44(0)1442 242 330
Fax: +44(0)1442 249 327
Website: www.vesda.com

3M™ NOVEC™ 1230 FIRE PROTECTION FLUID RECEIVES U.S. EPA SNAP APPROVAL FOR TOTAL FLOODING AND STREAMING APPLICATIONS

U.S. EPA Reports that Novec 1230 Fluid Significantly Reduces Overall Risk to the Environment

3M Performance Materials today announced 3M™ Novec™ 1230 Fire Protection Fluid, a C6-fluoroketone halon alternative, received Significant New Alternatives Policy (SNAP) approval from the United States Environmental Protection Agency (U.S. EPA). The SNAP approval lists the agent as an acceptable halon 1301 replacement in flooding applications and as an acceptable halon 1211 replacement for nonresidential streaming applications.

The U.S. EPA cites that Novec 1230 fluid provides an improvement over use of halon 1301, hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs) in fire protection and by comparison "significantly reduces overall risk to the environment". The fluid has an atmospheric lifetime of five days compared to 33 years, the next lowest atmospheric lifetime of halogenated alternatives. This technologically advanced agent has a Global Warming Potential (GWP) of one, which is equivalent to the GWP of naturally occurring carbon dioxide – a revolutionary reduction for halogenated alternatives to halon.

"Receiving SNAP approval from the EPA is a milestone for 3M," said Kurt Werner, Diplomat American Board of Toxicology and environmental, health, safety and regulatory manager at 3M. "HFCs are identified in the Kyoto Protocol as greenhouse gases targeted for emission reduction because of their high global warming potential. As alternative fire protection technologies with low climate impact become available, such as Novec 1230 fluid, it's likely that regulatory pressures will increase making it more difficult to build or grow a sustainable fire protection business using HFCs."

For more information please contact:
3M Corporate Communications, 3M Center,
Building 225-1S-15, St. Paul, MN 55144-1000
www.3M.com

"EASY-FIT" DUCT SMOKE DETECTOR UNVEILED AT FIREX

Designed for simple installation and maintenance, a new smoke detector for HVAC ducts will join the fire detectors and accessories from **Air Products and Controls** at International Fire Expo. Shaped to fit onto square or round ductwork, the SL-2000 Series detector draws air through front-loaded sampling tubes, removing the need for time-consuming connection of rear fittings. A simple installation kit requires no additional gaskets, screws or filters to install or lose, and the unit can remain in place on the duct for cleaning.

Compatible with the low air speeds of modern air handling systems, the detector is UL-listed for flows down to 100 ft/min. Should smoke be detected, high-current relays can shut down a complete HVAC system if necessary. The detector can also trigger accessories such as horns, strobes, remote status indicators and remote test/reset switches. Up to 30 detector units can be interconnected for common alarm functions.

For more information please contact:
Air Products and Controls Inc.
Tel: +1 (1)248 332-3900
www.ap-c.com

BALDWIN BOXALL AT INTERNATIONAL FIRE EXPO 2003

19th–22nd May
Stand B30, Hall 9

BALDWIN BOXALL COMMUNICATIONS LIMITED will be displaying their new range of Fire Telephones – VIGIL Fire-Care – for the first time at International Fire Expo. VIGIL FireCare is a sophisticated emergency fire telephone system developed in accordance with BS5588 part 11 and BS5839. The system enables fire officers/building management to report the status of any emergency within a building quickly and efficiently to a central control room. The simple to operate system will aid safe evacuation of a building and is designed to work totally independently.

As well as the Fire Telephones Baldwin Boxall will be showing their recently introduced VIGIL 2 Voice Alarm Class D amplifiers. The amplifiers are greater than 80% efficient (compared to typical 'AB Class' amplifiers of 60%), drawing less current and, therefore, reducing unwanted heat. There are three amplifiers in this new range from Baldwin Boxall. One of the additional benefits of the new Class D amplifiers is that smaller batteries are required for standby power. Also included in this range is a new Switch Mode Power improving efficiency and reducing unwanted heat dissipation.

Also on display will be the touch screen and download software for the popular VIGIL BVR20 Microdrive twenty-zone Voice Alarm routeing matrix. The software enables engineers to re-program the BVR20 on site from their laptop computer – saving time and money. The touch screen provides an easy-to-use front end for the system operator. The BVR20 Microdrive meets BS5839 Part 8 and EN60849 standards and has been successfully installed in many public buildings. The BVR20 will be shown in operation with the BVR16M 16-zone microphone controller.

Baldwin Boxall staff look forward to welcoming visitors to their stand number B30, Hall 9, serving well kept Harvey's real ale from The Plug & Socket – Baldwin Boxall's Freehouse.

For more information please contact:
Baldwin Boxall
Tel: +44 (0)1892 664422
E-mail: nick@baldwinboxall.co.uk

MULTI CABLE TRANSITS – FIRE-RESISTANT, GAS- AND WATERTIGHT!

bst Quick Fix TCM reduces 50 different cable modules to only 5 module sets!

bst-Brandschutztechnik introduces an entirely new modular system for fire-resistant cable and pipe sealings. The core of this development are so-called adaptable modules made from fire-resistant rubber which can be adjusted during assembly to every cable or pipe diameter, an innovation which will facilitate the installation of cable sealings in future. Taking for example module size 30: two adapters and one basic module of the new TCM Technology (Tolerance Cable Module), supplied as one complete set, replace 12 standard modules. No more measuring of cable diameters on site, no more searching for the suitable module during assembly, simply Quick-Fix!

Basically, a modular-design system consists of frame elements which fit exactly into the penetration aperture and provide the basis for the modules. As soon as cables or pipes were installed

the exact diameter of these ducts had to be measured to find the suitable module from a multitude of different system parts. Thus, quite a lot of time was devoted to the planning and the assembly of a fire-resistant or gas- and watertight sealing.

The TCM Modular System "Quick Fix" facilitates substantially the planning in detail and work on site. In the past the suitable module had to be determined from a number of more than 50 system parts. Now only 5 module sets serve the same purpose. One basic module and two adapter modules each increase tolerances of ducts to be sealed to such a degree, that with a minimum of sealing elements a maximum reduction of planning and assembly time is achieved. At the same time storage, packing and delivery are simplified. bst – "Quick Fix" has already been subjected to various tests and is approved according to BS 476/20 (4 hours), DIN 4102/9 (S90) and IMO 754/18 (SOLAS A60).

For more information please contact:
bst Brandschutztechnik
Tel: +43 1 970970
www.bst-firestop.com

INTRINSICALLY SAFE, EXPLOSION PROOF AND HEAVY DUTY SOUNDERS AND BEACONS

European Safety Systems design and manufacture high output sounders and strobes. For use in Hazardous Areas, the L101L-IS Intrinsically Safe flashing beacon uses an array of ultra bright LEDs to give a far more effective visual warning than Xenon tube alternatives. The A105N-IS 105dB(A) Intrinsically Safe sounder can be used in combination with the L101-IS, powered through the same Zener barrier or galvanic isolator and mounted together or separately.

The BEx Explosion Proof family consists of EEx d and EEx de 121dB(A) sounders, 25 Watt loudspeakers, 15 Joule beacons and combined units. For use in marine applications, the MA variant is manufactured from flame-retardant ABS rather than aluminium.

For more information please contact:
European Safety Systems Limited
Tel: + 44 (0)20 8743 8880
www.e-2-s.com

AC – THE ALTERNATIVE TO RUBBER

Thermaflex AC is the new, innovative pipe insulation material from **Flexalen UK.**

Thermaflex AC has the following features:

- Class "O" fire rating
- Low smoke/toxicity – far lower than rubber!
- Excellent UV stability, no more painting!
- Superior tear resistance – not easily damaged!
- Remains fully functional even if surface is damaged!
- Unrivalled flexibility even at <0°C!

Thermaflex AC is available in a wide range of thicknesses and diameters.

With its built in functional flexibility, Thermaflex AC is easy to push round corners and edges.

For marine, refrigeration, cooling, heating, hot water or air conditioning, Thermaflex AC is the professional choice.

For more information please contact:
Flexalen H&CP Limited
Tel: +44 1592 264050
www.flexalen.co.uk

GINGE-KERR IN INERTS

Ginge-Kerr, founded as a fire extinguishing company in 1917, has based their experience in gas extinguishing systems, on many years' development, design, and supply of CO_2- and Halon systems for the marine and industrial sector. The discovery of the shrinking Ozone layer in the late eighties and the following restrictions and ban on use of CFC's gave us opportunities. Ginge-Kerr was dependent on our CO_2 and Halon products and we had to choose our path to the future and decide which alternative to Halon we should bring to the market.

Inerts was our choice. Besides the environmental issues, our main point of view was that legislation forced industry to demolish well functioning Halon systems and replace with something more environmental friendly. This could happen again with HFC's. As a Danish company we were also influenced by the fact that Denmark has had a ban on the use of HFC's for fire extinguishing systems since the eighties.

Ginge-Kerr developed the Argonite system, based on Nitrogen and Argon, and we started to sell 150 Bar systems in 1992 and in 1995 we changed to 200 Bar which meant increased compatibility with regards to price and occupied space for the cylinder battery. Following this, we continued to develop the 300 Bar system. As the EU worked with new directives for Pressure Equipment (PED) and Transport Pressure Equipment (TPED), and these directives included more severe test requirements, we decided to redesign our cylinder valve concept to comply with these new directives. In 2000 we launched our new 300 Bar system, that has been tested according all new standards and approved by regulatory bodies throughout the world. Ginge-Kerr is supplying the most sophisticated Inert Gas Extinguishing Systems and our Argonite Systems are used to protect satellite control stations, F16 test chambers, underground control facilities for the biggest submersible highway/railway tunnels worldwide, airports and have more than 25.000 installations all over the world.

Ginge-Kerr develops for a more environmentally friendly future.

For more information please contact:
Ginge-Kerr Danmark A/S
Tel: +45 36 771131
www.ginge-kerr.com

The **KAC** UL Approved Pull Station, designed for the North American market, affirms the company's position as the world's leading supplier of manual activation devices for fire alarm systems. Ranging from simple single action devices to high-end waterproof

addressable products, the initial family includes 18 variations. The units can be mounted directly to a single gang electrical box or to an optional surface mount box. Actuation is either by a single pull or by a dual push then pull action. Once activated, the unit remains in the activated position until it is manually reset by authorised personnel using the supplied tool.

For more information please contact:
KAC
Tel: + 44 1527 406655
www.kac.co.uk

GE INTERLOGIX KILSEN – NEW PANELS TO MEET ANY REQUIREMENT

GE Interlogix Kilsen is expanding its range of fire alarm control panels. The analogue addressable series benefits from the introduction of the new KSA701/1 and KSA701/2, one and two loop analogue addressable control panels, whilst the NK700 series 2 to 16 zone conventional fire panels with a new 3 and 6 zone gas extinguishing panels enhances the conventional control panel series. These additions places Kilsen amongst the leading manufacturers in the European fire detection business.

The new KSA701 completes the KSA700 series (see chart), bridging the gap between larger conventional and standard analogue addressable systems. Amongst other features, it has a capacity of 125 detectors + 125 I/O modules per loop, a standard RS232 and an optional RS485 communication port. And all this on only one compact motherboard! These panels are aimed at small to medium sized installations where advanced technology in fire detection is an essential requirement.

The KSA702 and KSA705 remains the standard product for larger installation projects that require greater flexibility with options like built-in printer, GPS communication or networking in a peer-to-peer configuration.

The new NK700 series conventional control panels have been designed and manufactured to comply with European standards and has approvals pending. It offers yet another step forward in conventional panel design and operation. Two of the models in this series are designed for the control of 1 or 2 extinguishing zones, providing all the necessary inputs and outputs for monitoring and control of such areas.

The flexibility of all the new panels is further enhanced with more than 10 different operational modules that fulfil every possible requirement for the complete protection of any premises.

With these new products in the range, Kilsen is offering its customers a solutions for every requirement in fire detection.

Model/loops	Addresses	RS-232	RS-485	Built-in Printer
KSA701/1	125	Included	Optional	-
KSA701/2	250	Included	Optional	-
KSA702/1	250	Optional	Optional	Optional
KSA702/2	500	Optional	Optional	Optional
KSA705/3	750	Optional	Optional	Optional
KSA705/4	1000	Optional	Optional	Optional
KSA705/5	1250	Optional	Optional	Optional

For more information please contact:
GE Interlogix Kilsen
Tel: +34 934809070

NEXT TWO PRICE PROMISE

MEDC Ltd, the manufacturer of the Next Two range of loudspeakers for background music, voice alarm & background music applications, has launched a price promise campaign to celebrate the relaunch of the Next Two range.

Since purchasing the Next Two product range in 1999, the company has invested in redesigning and reengineering the range to offer high quality yet affordable commercial loudspeakers with an extensive stock of products available for same day despatch.

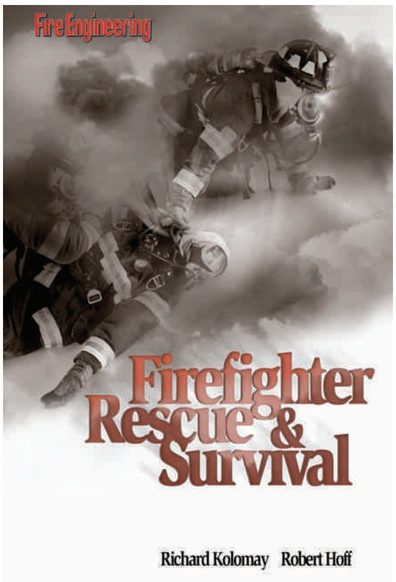
The price promise is "To match or beat any price quoted on a like-for-like basis" and is applicable to its range of commercial, explosion-proof, industrial and marine loudspeakers.

To take advantage of the price promise, customers are simply asked to provide details of which loudspeakers they buy in certain quantities.

The Next Two range of VA loudspeakers and the MEDc range of manual, visual and audible alarms will be on show at International Fire Expo, Stand B40.

For more information please contact:
Next Two
Tel: +44 (0) 1773 864100
www.medc.com

NEW BOOK AIMS TO IMPROVE FIREFIGHTER SAFETY



TULSA (Okla.) – Fire Engineering Books & Videos, a division of **PennWell Corp.**, announces the upcoming publication of *Firefighter Rescue & Survival*, a technical rescue manual by veteran firefighters Richard Kolomay and Robert Hoff that will be available in April 2003.

Firefighter Rescue & Survival was written to reduce the number of line-of-duty firefighting injuries and deaths for both public fire departments and private industrial agencies. This book provides information and recommended operational procedures for Rapid Intervention Teams, firefighter fatality histories, and case studies for lessons learned. *Firefighter Rescue & Survival* includes training information, illustrations, and pictures concerning firefighter self-survival skills and firefighter rescue techniques.

Key features and benefits:

- Provides an awareness of firefighter safety and proactive fire service training

- Describes various types of serious firefighter injuries and fatality incidents during emergency incident operations
- Details recommended Rapid Intervention Team operating methods and procedures, as well as how to activate a Rapid Intervention Team.

Firefighter Rescue & Survival is available from Fire Engineering Books & Videos for $54.95 US.

For more information please contact:
Fire Engineering Books & Videos
Tel: +1.918.832.9240.
www.pennwell-store.com

FIRE RATED GLASS IN SCHOOLS

The familiar grid of wire mesh embedded in glass is a familiar site in many schools and universities across North America. For over 100 years, wired glass was the only option available. While wired glass can withstand fire testing, it cannot withstand High Impact Safety Testing and is such a hazard to human injury that its use is being restricted.

Innovations in technology have created glazing materials that are clear (no wires), provide protection against radiant heat transfer and provide a High Impact Safety Rating as well.

In North America, these clear products are somewhat new, but their popularity is quickly increasing due to expanded vision area, higher fire performance and because of liability issues associated with impact safety.

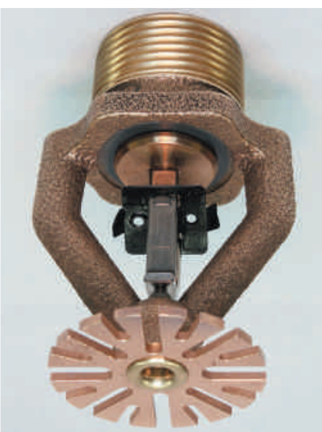
With the number of new products introduced to the North American market, from specially tempered products to clear glass-ceramics, to multi-layer intumescent laminates, and the advancement of new production technologies, the possibilities for safety while meeting design requirements continues to grow.

The recent code changes reflect the importance placed on human safety as well as building safety in the case of fire rated glazing. Certainly schools and athletic facilities will be safer and one would expect this ruling to soon apply to other occupancies as well.

Products now exist to accommodate virtually every condition. With a little research architects and designers can now find products that balance cost and performance against design and code requirements.

For more information, please contact:
Vetrotech Saint-Gobain North America, Inc.
Tel: +1 (253)333-0660
www.vetrotech.com

NEW ESFR PENDENT SPRINKLER WITH 25.2 K-FACTOR



The Viking Corporation, global manufacturer of fire protection systems, has added a 25.2K ESFR pendent sprinkler to its current ESFR line. An extension of prior ESFR technology, this product provides more options and flexibility for the most challenging storage applications.

This roof-mounted K25.2 sprinkler meets FM guidelines for protecting buildings to 45ft (13,7m) in height that have storage up to 40ft (12.2m) high. It can protect most common storage materials, including severe-challenge fires of palletized and solid pile storage, from Class I commodities to rubber tires.

With its higher K-factor, the K25.2 provides ESFR performance with lower end head pressures than 14K ESFR sprinklers. As a result, smaller – and less expensive – pipe, fittings and hangers can be used, and costly system fire pumps can be downsized or eliminated. The guidelines for installing K25.2 sprinklers allows maximum deflector-to-ceiling distance of 18in. (456mm), and as the overall length of the Viking sprinkler is about ⅓ smaller than comparable sprinklers, this adds up to an easier, more flexible, cost-effective installation.

With its sturdy link design and protective shipping caps, the K25.2 is less susceptible to damage during transport and installation. And once installed, these sprinklers are far less vulnerable to damage than rack-mounted sprinkler, further enhancing their long-term dependability.

Viking is a leader in the manufacture and distribution of innovative fire protection equipment. Their products are sold in over 70 countries worldwide through an integrated distribution network.

For more information please contact:
The Viking Corporation
Tel: +1 877-384-5464
www.vikingcorp.com

VIKING'S NEW RESIDENTIAL PENDENT SPRINKLER OUT PERFORMS THE REST

The Viking Corporation, global manufacturer of fire protection systems, has expanded their residential line to include a new 5.2K Pendent Sprinkler. This joins our full line of residential sprinklers that's already known for its quality, integrity and dependability.

The K-5.2 Residential Pendent Sprinkler offers minimum flows and the best performance currently available in 18ft x 18ft (5.5m x 5.5m) and 20ft x 20ft (6.1m x 6.1m) coverage areas, while offering competitive flows in coverage areas as low as 12ft x 12ft (3.7m x 3.7m).

With a 5.2 K-factor, this sprinkler (VK436) is UL Listed for residential occupancies below smooth, flat, horizontal ceilings. It is approved for 155°F and 175°F temperatures, is available in variety of decorative finishes and can be installed surface-mounted or recessed.

Viking is a leader in the manufacture and distribution of innovative fire protection equipment. Their products are sold in over 70 countries worldwide through an integrated distribution network.

For more information please contact:
The Viking Corporation
Tel : +1 877 384 5464
www.vikingcorp.com

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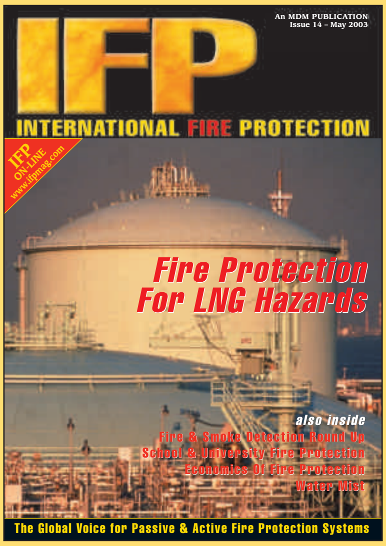
INTERNATIONAL FIRE PROTECTION

GET YOUR SUBSCRIPTION NOW!!!



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Enquiries: www.vestafire.it
studiosuccesso pubbl.

Start thinking about replacing your Halon system now, while you still have time.

Regulation EC No 2037/2000 on substances that deplete the ozone layer. Article 4. Paragraph 4 (v) Fire protection systems containing halon shall be decommissioned before 31 December 2003.

(a small number of exceptions are listed in Annex VII in the regulations).

Now is the time to decide which system you are going to install and when you are going to install it.

Why Now?

- Allow enough time for a thorough evaluation
- Take control and make the conversion on your time line, not someone else's
- Eliminate the last minute rush when demand for technical resources will be overloaded and conversion costs at a premium

Why FM-200®?

- Fastest fire suppression system on the market
- Safe for people and sensitive equipment
- Environmentally safe
- Simple to install and occupies up to 7 times less space than an inert gas system
- More than 100 thousand customer applications in over 70 countries makes FM-200® the most widely accepted clean agent in the world

To find out more about why an FM-200 system is ideal for Halon replacement, call **+44 (0) 161 875 3058** or visit **www.FM-200.com**.

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FM-200®

The World's Most Trusted Choice In Clean Agent Fire Suppression.

An MDM PUBLICATION
Issue 15 – August 2003

IFP

INTERNATIONAL FIRE PROTECTION

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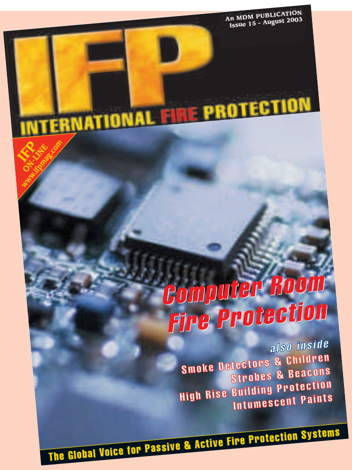

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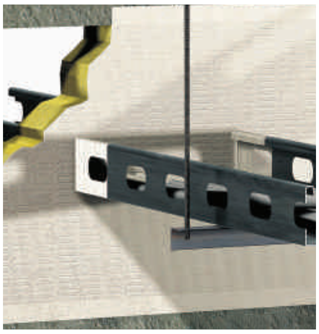

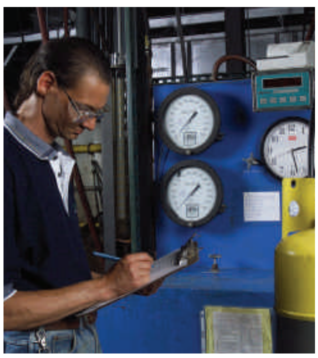

Sleeping children & smoke alarms

MARCI DOUGLAS STILL CRIES when she watches the videotape. "I can't help it," she says. "It's so intense to watch. If it had been a real fire…" Her voice trails off. If she thinks about the "if," she'll start to cry again. If it had been a real fire, her son would be dead.

NFPA INTERNATIONAL

By Shelly Reese

The video to which Douglas refers is a 2001 report depicting sleeping children's responses to smoke alarms that WCCO-TV in Minneapolis produced with the help of the Bloomington, Minnesota, Fire Department. Marci's son Mitchell, then 10 years old, was one of four children WCCO tested to see how they would react to a smoke alarm in the night.

Their responses are frightening. One boy ran through the smoke rather than use a secondary exit. A little girl woke but didn't recognize the sound of the alarm. A third child didn't wake to the alarm and, when prodded by his mother to escape, simply froze.

However, watching Mitchell is what brings tears to his mother's eyes.

"I didn't think much about it before the test," Douglas says. "Mitchell is a smart boy. I thought he'd hop right out of bed. I thought there was a chance he might run right out the bedroom door and into the smoke, but it never occurred to me he wouldn't wake up."

He didn't. Not for almost 15 minutes.

Since WCCO conducted its study, similar stories have aired across the country, in places like Columbus, Ohio; Des Moines, Iowa; Milwaukee, Wisconsin; and Jackson, Mississippi. What was once shocking has become terrifyingly commonplace: as alarms urgently sound, children sleep.

REPORTS SPUR NEW RESEARCH

Researchers have long known that children sleep differently from adults and that their sleep is especially sound in the hours soon after they first fall asleep. The younger the child, the longer the deep-sleep phase is likely to last.

How that relates to smoke alarm audibility has only recently become an issue, however, thanks largely to news reports and more formal studies. Because children 5 and under and adults 65 and older — for whom smoke alarm audibility might also be an issue — are twice as likely as the general population to die in a home fire, the research has commanded the attention of everyone interested in fire safety in the home.

Last January, the U.S. Consumer Products Safety Commission launched a two-year study to investigate smoke-alarm audibility among children and the elderly, and NFPA's National Fire Protection Research Foundation is seriously considering conducting a study of the issue, according to Foundation President Rick Mulhaupt. To bring NFPA members up to speed on the issue, NFPA also invited Dr. Dorothy Bruck, who has conducted seminal research on the topic in Australia, to speak at its World Safety Conference and Exposition™ in Dallas last May.

In addition, Underwriters Laboratories (UL) made the subject the centerpiece of its March 7 smoke alarm standard technical panel meeting in Northbrook, Illinois, establishing two working groups to study the topic in detail.

The first group, composed of pediatric sleep experts, safety engineers, government officials, and manufacturers, was charged with gathering information and proposing future research designed to better understand the physiological and technical aspects of the issue. Such research could lead to changes in the way smoke alarms operate and how they are installed and used. The second group, composed of UL members, NFPA members, fire prevention and education specialists, and manufacturers,

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In subsequent research, Bruck's findings further complicated the issue: simply installing an alarm in a child's room is unlikely to solve the problem.

is developing an educational campaign to raise public awareness of smoke alarm and fire safety issues.

Such research and discussion are welcome, says Rita Fahy, NFPA's manager of fire databases and systems, who spoke on the topic at the Fire Suppression and Detection Research Application Symposium in Orlando, Florida last January, because the data available to date "raise more questions than answers."

STUDIES RAISE CONCERNS

While less emotionally charged than the televised images of children sleeping through alarms, scientific studies published on the topic are equally alarming.

Bruck, a psychologist at Victoria University in Australia, was the first to identify the problem. In her 1999 study published in the *Fire Safety Journal*, Bruck tested 20 children between the ages of 6 and 17 to determine their response to a 60-decibel alarm sounding at their pillows. She conducted her test twice and found 17 of the children slept through one or both tests. Two of the three who woke were 16 and 17 years old, among the older children in the sample. Indeed, for the children 15 and under, the reliable waking rate was only 5.6 percent. In contrast, Bruck found all of the parents woke when the alarms sounded.

In subsequent research, Bruck's findings further complicated the issue: simply installing an alarm in a child's room is unlikely to solve the problem. In a presentation to the fourth Asia-Oceania Symposium on Fire Science and Technology in 2000, Bruck and fellow researcher Angela Bliss reported their findings from a study of 28 children between the ages of 6 and 15. In two tests, the children were exposed to an 89-decibel alarm; half slept through one or both tests. Among the 6 to 10year olds, that percentage climbed to 71 percent. When children did wake, they were groggy for several minutes, a factor that might well have impaired their ability to make life-saving decisions in a true emergency.

While adults and fire protection experts may be surprised by those numbers, kids themselves might not be.

Derrick Ethridge, fire prevention officer for the Loyalist Township Emergency Services in Ontario, Canada, decided to study the issue of audibility when children in the schools he visits told him they didn't think they'd hear an alarm if it went off.

"They kept telling me, 'I don't think I'd hear it,' or 'I sleep with my door closed,' or 'I don't think I'd wake up,' " he recalls. "I suspected there was a problem just on the basis of what the kids were telling me, and I wanted to find out if that was true."

With the help of Professor Alistair MacLean of the Queens University Sleep Lab, the Canadian Hearing Society, the Limestone and Algonquin school boards, and the parents of 222 Loyalist Township sixth graders, Ethridge decided to conduct an experiment. Parents were asked to activate the smoke alarms outside their sleeping children's bedrooms between 9 and 11 p.m. on two separate nights in April 2002 and time how long it took the children to awaken. Tests were conducted once with the door closed and once with it open. The children knew they'd be tested but didn't know when.

The team found 31 percent of the children didn't wake up at all when the smoke alarm was activated, and 53 percent didn't react within the first minute. Ethridge later conducted random audibility tests of 22 of the homes. Testing once with the bedroom door open and again with it closed, he found audibility in some cases dipped as low as 64 decibels.

"Some parents wrote back, 'I took the damn smoke alarm off the ceiling, put it over my kid's head and he didn't move.' Or they said the alarm rang until the batteries went dead, and the child never woke up," he says. "They were definitely concerned."

As disconcerting as research such as Bruck's and Ethridge's may be, it must be considered in light of overwhelming data demonstrating smoke alarms' proven benefit. Since the early 1970s, when smoke alarms made their way into homes, residential fire deaths have been cut in half. Homes with smoke alarms – operational or not – have a death rate 40 to 50 percent lower than the rate for homes without alarms, says Fahy.

Today, the overwhelming majority of fatalities take place in homes that aren't equipped with alarms or in homes where the equipment is broken, dismantled, or missing a battery. Half of the people killed in home fires each year die in the 6 percent of homes that don't have smoke alarms. Of the fatalities that do take place in homes equipped with alarms, half occur in cases in which the smoke alarm doesn't sound.

MORE RESEARCH NEEDED

The fact that children are sleeping through alarms must be studied against

Today, the overwhelming majority of fatalities take place in homes that aren't equipped with alarms or in homes where the equipment is broken, dismantled, or missing a battery.

this backdrop, Fahy says, and the magnitude of the problem can't be diagnosed without additional research.

"Of all home fire deaths, we're talking about a subset of the 25 percent that occur in homes with operable alarms," she says, "and we need to know more about those cases."

For example, how are people alerted when nighttime fires occur? Are alarms waking parents who then shuffle their children out of the house? If so, are the alarms accomplishing their aim by alerting parents and enabling the family to put its escape plan into action?

While the media focus has been on children sleeping through alarms, what about older residents who are most likely to have hearing loss and are more likely to live alone or with other seniors? Would different types of alarms, such as voice notification or a lower frequency, achieve better results? Would interconnecting alarms make a substantial difference?

Without at least some of that information, it's impossible to draw actionable conclusions from existing studies and news reports, Fahy says.

John Drengenberg, UL's manager of Consumer Affairs and moderator for the March panel discussion on the topic, voiced the same sentiment.

"Based on what we heard from pediatric sleep experts and fire prevention officials, there might not be a single answer to this complicated issue," he says.

PRACTICE STILL THE BEST SOLUTION

While officials study the issue and try to ascertain how best to address it, NFPA President Jim Shannon emphasizes that parents shouldn't let their concern about the issue distract them from the larger issue of fire safety.

"If parents conclude from the demonstrations that they don't need some alarm protection, they'll be dead wrong," he says. "The fact is, smoke alarms do work. What remains to be seen is if we can make the technology better and use it more effectively."

Lee Richardson, NFPA staff liaison for NFPA 72®, *The National Fire Alarm Code®*, counsels parents not to "throw the baby out with the bathwater."

"People shouldn't get tunnel vision," he says. Instead, they need to focus on maintaining their smoke alarms and practicing their home escape plans.

Research indicates that familiarizing children with the sound of the alarm and practicing escape drills can have a profound effect on outcomes.

NFPA 72 contains requirements for the type of sound pattern an alarm emits and how loud it should be. Although the location of alarms in homes in any U.S. community is determined by local building codes, NFPA 72 cites NFPA 101®*, Life Safety Code®*, as an example of a typical code.

While recent news coverage has raised awareness, NFPA's technical committees aren't currently considering changing the codes, Richardson says. The next edition of the *Life Safety Code* is scheduled for publication in 2006, although that schedule could be accelerated if research identifies areas where critical improvements could be made.

As Shannon notes, however, the effectiveness of smoke alarms has as much to do with practices in the home as it does with codes and standards.

"As safety groups, including NFPA, explore the issue, there's still very good reason to remain confident about the role of smoke alarms in home fire safety systems," he says. "In the near term, the lesson parents should take away from these news broadcasts is that they won't know how their children will react to the smoke alarm until they've tested their response to it. Home fire drills are essential."

Research indicates that familiarizing children with the sound of the alarm and practicing escape drills can have a profound effect on outcomes. Bruck cites research indicating that subjects who were primed to respond awakened 90 percent of the time. Those who weren't woke only 25 percent of the time.

Families who participated in the WCCO broadcast had a similar experience. After the four children failed the initial test, their parents talked to them about fire safety. They also laid out home escape plans and practiced them. Marci Douglas discussed fire safety with Mitchell, then activated the smoke alarm with a broom handle so her kids would recognize its sound during an emergency.

When WCCO repeated the drill several weeks later, all four children awoke and carried out the drill to the letter.

ENCOURAGING FAMILIES TO PREPARE

Judy Comoletti, director of NFPA's Public Education Division, not only emphasizes the importance of developing and rehearsing home escape plans, but suggests that parents activate their smoke alarms and conduct their drills at night, so they can better gauge the reaction of everyone in the household. Children and the elderly aren't the only ones at risk of sleeping through an alarm, she notes. Sleep-deprived college students, shift workers, teenagers, the hearing impaired, and anyone taking sedating medication might conceivably be affected, as well.

"Every family should know who will – and won't – wake up at the sound of the alarm so they can accommodate any special needs," she says. If someone is hard to rouse, Comoletti suggests installing additional hard-wired, interconnected alarms in every bedroom. If this doesn't work, she encourages families to design an escape plan that assigns an adult who awakens easily to rouse the sound sleepers.

"We all think we know our kids so well, and we think we know how they will react to A, B or C," says Douglas. "We think they're so smart they'll know just what to do. However, the reality is you don't know at all until it happens. You have to practice. It's like helping your kid prepare for a spelling test. You have to drill them."

MARKET LEADERS

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DIESEL ENGINE CONTROLLERS

Standard Features

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- Alarm & Status LED Indication
- LCD Message Retrieval – Last 1024 Messages
- Pressure Transducer – 600 PSI Max.
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Picture courtesy of Cutler-Hammer

Foam Pumps & Controllers

By ROB HARRIS – EATON Cutler-Hammer
Pump Controller Marketing Manager

WARREN HILL III – WEH International LLC
Director WEH

TOM RESER – Edwards Manufacturing Inc.
Director of Sales

FOAM PUMP SYSTEMS have been used for over 50 years in applications that require containment and/or extinguishing of flammable liquids. As technology has evolved, the components of the system have improved, however the basic purpose has not changed.

Foam pump controllers are an integral component in foam pump systems. To gain a better understanding of the foam pump controller, we must also look at the operation and effect the controller has within the entire system.

Foam Applications

Foam concentrate systems are designed to extinguish flammable liquids in a variety of applications where the liquids are used, stored, processed or transported. Typical installations include, petrochemical processing facilities, aircraft hangar, oil and flammable liquid cargo tankers, offshore processing platforms, liquid storage tank farms and shipboard fire fighting systems.

Installation of foam pump systems tend to be a pro-active approach to fire prevention, rather than fire extinguishing. Once a flammable liquid has been spilled and the foam system initiated, the foam typically covers the flammable liquid surface, which prevents it from igniting from a random spark. Should the foam come in contact with material that has already been ignited, the water in the foam solution turns to steam. The foam helps surround the steam with the result of a reduced amount of oxygen being available, which assists with extinguishing the burning material.

Picture courtesy of Cutler-Hammer

Purpose/Operation of the Controller

Foam Pump Controllers are designed specifically for foam service and conform to NFPA 20 Chapter 7-9 requirements. The number of controllers being requested to carry UL/FM approval is growing steadily.

In a typical foam system installation there are usually two foam pump controllers. They are used as duty and standby units and are usually installed as a combination of two electric controllers; one electric and one diesel controller, or two diesel controllers.

In almost all cases (approximately 95%), the starting method for foam pump controller systems is via a manual start signal that is received from a remote pushbutton or call station.

In a non-pressurised system, once there is a call to start, both the duty and standby controllers receive the start signal. The duty controller starts to

Picture courtesy of Cutler-Hammer

instantly flow the foam concentrate through the foam line to the foam proportioner, where it mixes with the water system and is then flowed to the hazard. At the same time, the standby controller receives its' start signal and a delay timer is energised to delay the starting of the controller. Once the duty controller has the pump up to speed, a signal is sent to the standby controller to lock it out. Should there be a failure with the duty controller, it will turn off the lock out signal being sent to the standby controller. The standby controller will now determine if there is still a call to start, and will act accordingly.

Proof Pressure Switch

In some applications, a proof pressure switch is used to monitor the pressure in the foam line once the foam concentrate has begun to flow. Should there be a drop in pressure, (for example – the foam pump cannot keep up to the demand) the pressure switch sends a start signal to the standby controller in order to activate it. However, if the proof pressure switch does not indicate a drop in pressure in the foam line, the standby foam pump and motor will remain inactive.

If a pressurised system is used, a jockey pump and jockey pump controller are used to maintain the foam system pressure, similar to a non-foam system.

As well, the foam pump controller will be equipped with a pressure switch or transducer that is used to monitor and provide the start signal, rather than a manual start signal. The controller(s) operate the same as in a non-pressurised system.

The main differences between standard Fire Pump Controllers and Foam

Pump Controllers can be summarised as follows:

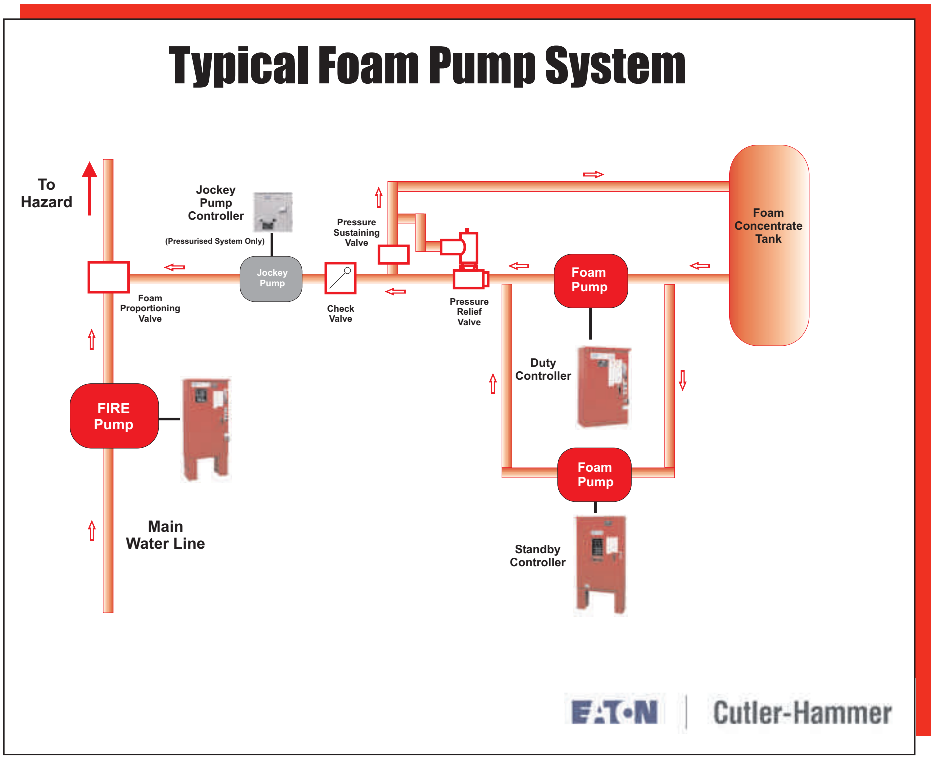
- The controller shall be marked "Foam Pump Controller."
- Where required, the controller shall contain a lockout feature when used in a duty-standby application. Where supplied, the lockout function must be indicated by a visible indicator. Provisions must be made for annunciating the condition at a remote location.
- Typical options found on foam pump controllers include humidistats, space heaters, pressure recorders and NEMA 3, 4 and 4X or equivalent IPC rated enclosures.
- Types of Foam Pump Controllers include full-voltage across-the-line electric controllers, limited service controllers, power transfer switch electric controllers and diesel engine controllers.
- All models must comply with NFPA 20 section 7-9 – "Controllers for Foam Concentrate Pump Motors".
- Most controllers carry various approval listings, which may include FM (Factory Mutual), UL, ULC, CSA, CE, LPC etc.

Differences between Diesel and Electric Foam Controllers

There is very little difference between an electrical foam and diesel engine foam pump system. Both are equipped with the necessary components to control the liquid foam concentrate required to prevent ignition of the flammable liquid. This will include a foam concentrate tank, UL/FM approved positive displacement foam pump, UL/FM approved pump driver (foam pump controller) and all the associated piping, valves, fittings and gauges as required by NFPA 20 Chapters 5 and 7-9.

Diesel System vs Electric

There are installation sites where the electrical service is not available or has been deemed unreliable. In these instances, a self-contained (except for a single phase 120V/220V, 50/60Hz power source for the battery chargers) diesel engine foam pump system is available.



Picture courtesy of Cutler-Hammer

In some cases, since the system is always under pressure and a positive displacement pump is used, the diesel engine may not have enough torque to rotate the pump shaft.

A remedy to this condition is to relieve the pressure in the foam concentrate system line by the use of a "dump" valve.

The dump valve receives a crank signal from the controller while it is sending a crank signal to the engine. The valve opens and relieves pressure by draining the concentrate back to the concentrate storage tank.

Once the engine has come up to it's running speed, the engine speed switch provides a "pump running" signal which simultaneously de-energises the dump valve. The foam concentrate now enters the water stream where it mixes and flows to the hazard location.

Picture courtesy of Cutler-Hammer

Limited Service Foam Pump Controllers

Limited service foam pump controllers are used when the application calls for a low horsepower of 30HP or less. As well, most foam pump engines used in diesel applications are listed up to 105HP only, as larger size engines and motors are not required to drive the foam pumps.

Advantages of Microprocessor Based Controllers for Foam Applications

The inherent features of standard microprocessor based controllers apply to foam pump controllers as well. This can include long lasting LED indicators rather than pilot lights that burn out over time.

All events surrounding the operation of the controller are stored within the controller, thus giving the ability to diagnose and troubleshoot problems

Foam Pumps & Controllers

based on an actual history of events. Events are time and date stamped and can be printed or downloaded to a laptop computer or floppy disk, rather than using a strip chart recorder that is difficult to read and analyse.

A main display unit will typically give a read out of parameters such as current pressure, volts and amps and will display error messages as well as provide alarm indication.

A status report is usually available from microprocessor based units and can also be printed or downloaded to a laptop computer or floppy disk. The status reports provide a record of the state of the controller as it was left after commissioning.

Picture courtesy of Cutler-Hammer

The stainless steel pressure transducer used for sensing pressure in the foam line can be installed directly onto the foam line, which can eliminate the need for a pressure line to be run into the controller. This will eliminate the installation of an additional proof pressure switch and reduce the overall cost of the installation.

Microprocessor based controllers have the ability to include extra relays that can be programmed for a wide range of functions with the microprocessor. This is a useful feature to have when on-site installation requirements are suddenly modified.

Conclusion

UL/FM listed foam pump systems and the controllers that operate them, provide a vital method of containing flammable liquids in a variety of hazardous situations. In turn, they protect property that can cost a substantial amount of money to replace (ranging into the millions of dollars) and they ultimately save lives, in some of the most volatile fire protection applications that exist. Therefore, it is imperative that the foam system and the controllers operate when required, and that the specifying authority takes into account life safety, as well as the long term financial and economic implications of the loss of operational capabilities, when choosing a foam pump system.

Introducing the
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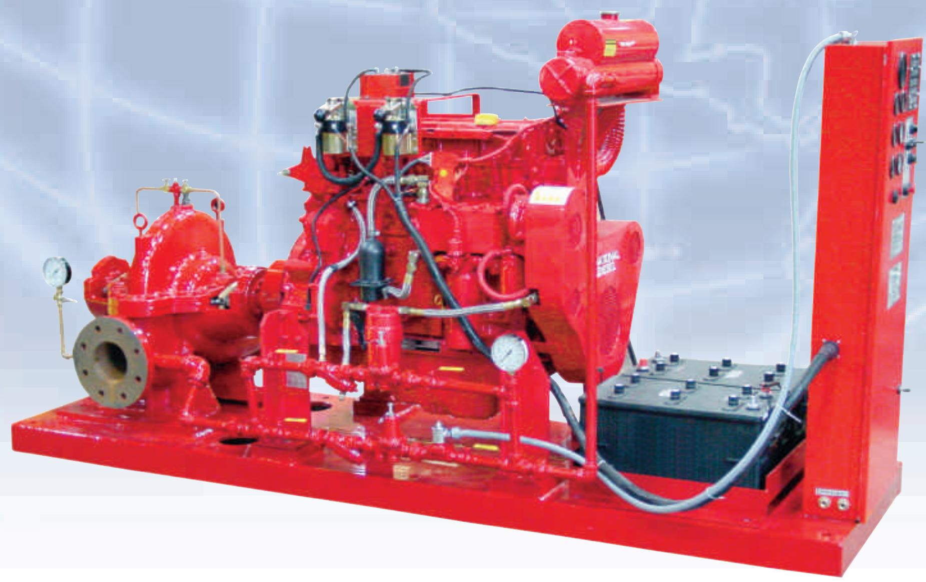

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As a combination diesel engine/ fire pump controller, the Patterson Engine Package (P.E.P.) greatly reduces the overall size and complexity of usual engine and pump controller setups.

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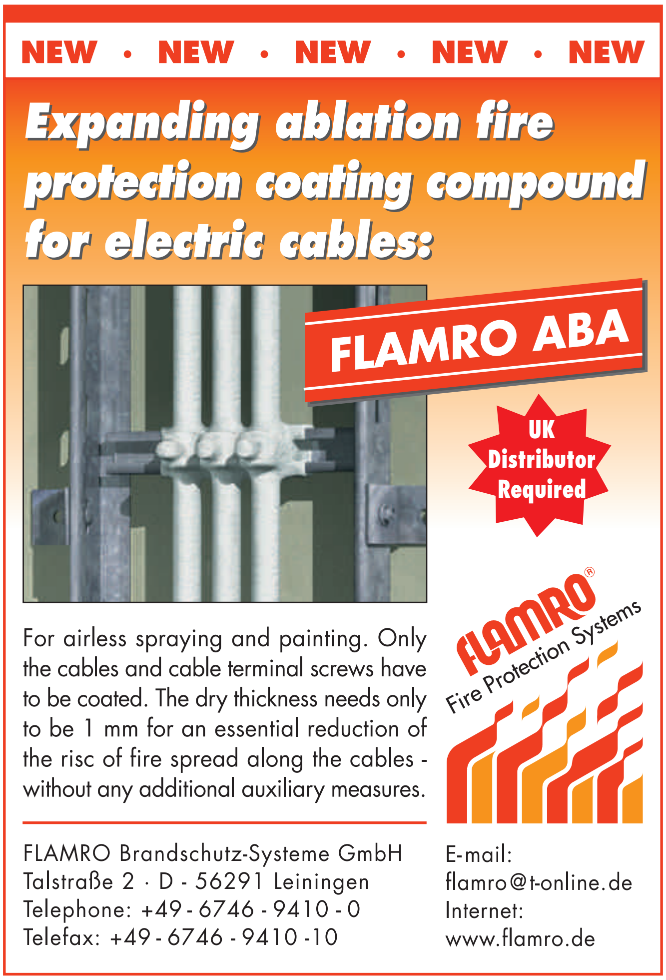

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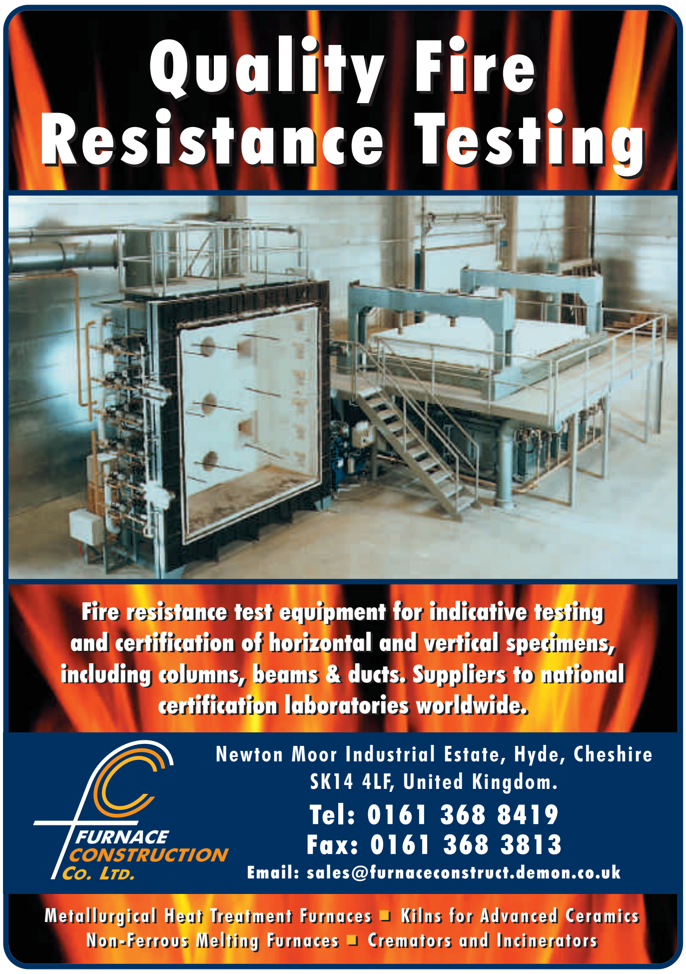

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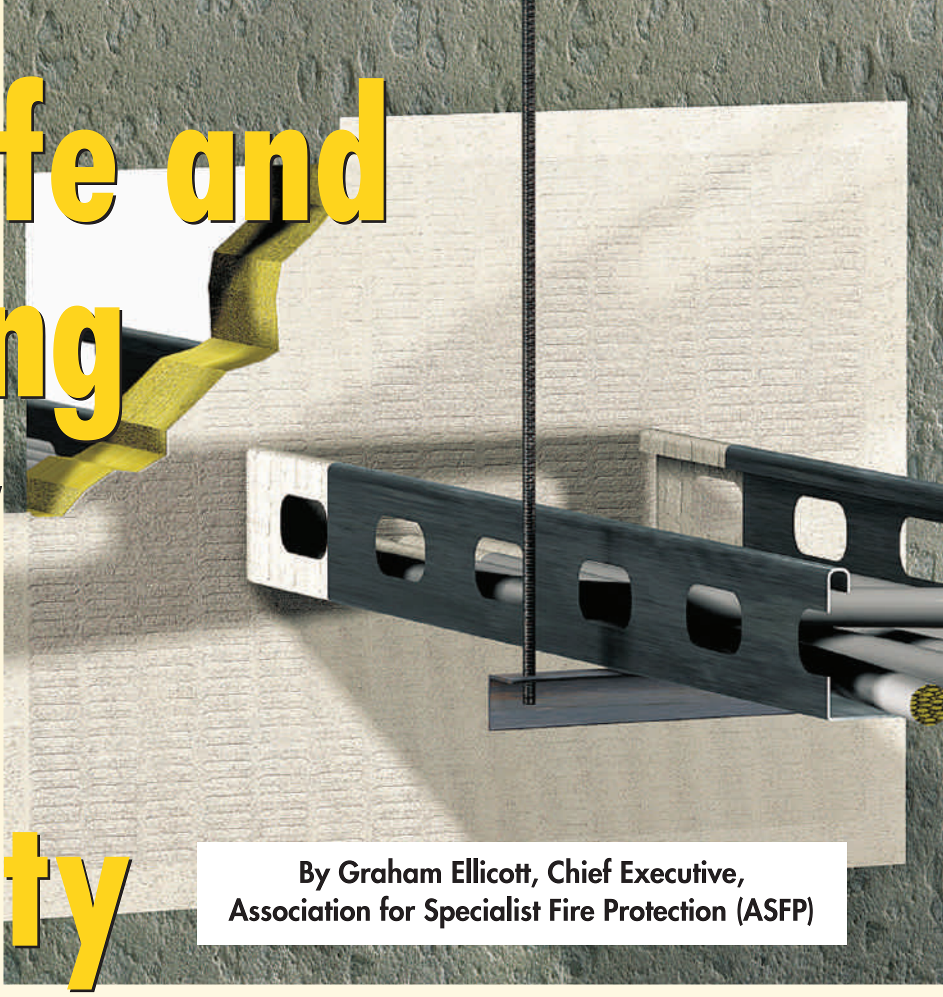


By Graham Ellicott, Chief Executive, Association for Specialist Fire Protection (ASFP)

GO THE EXTRA MILE, USE MORE PASSIVE FIRE PROTECTION!

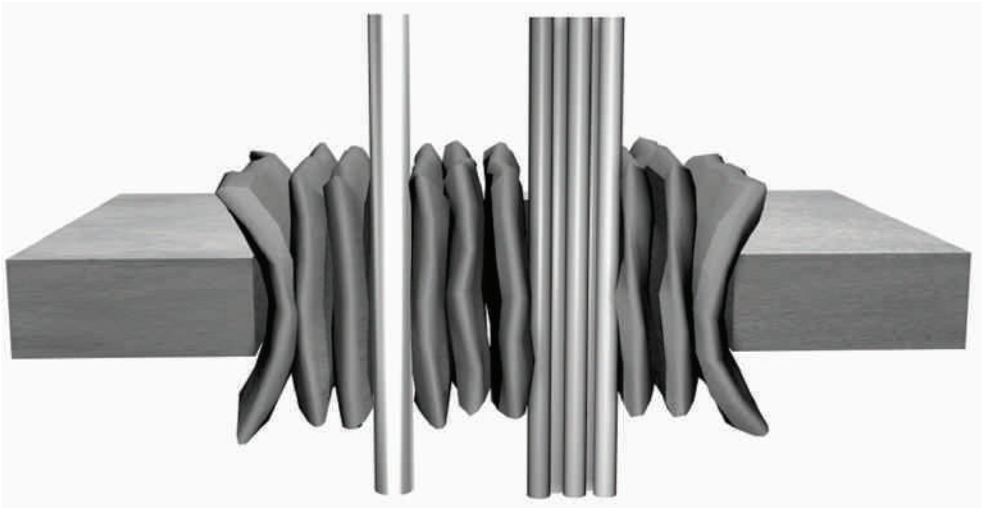
IN THE UK, THE RATIONALE of the Building Regulations is that "in an emergency the occupants of any part of a building should be able to escape safely without any external assistance" (Approved Document B to the Building Regulations, 2000 Edition). However, in many cases the designer of buildings/structures may want to go further and increase the level of passive fire protection, so as to give the fire services more time to extinguish the fire before the building collapses. This will of course provide extra comfort to insurers and also the fire-fighters who may have to enter a fire-ravaged building after the occupants have escaped.

The use of a higher level of passive fire protection in buildings is not just beneficial to the building's owners, insurers and to the fire-fighters. Take the case of a fire; say in a school, which wipes out most of the structure. The effect on the children's education is immeasurable, as they may need to be split up to continue their studies and course work for public exams. If destroyed, it could mean that they have to repeat a year. Schools are also a focus in the community; the school gate is where many parents have their only point of adult-to-adult contact during the day. In addition to providing education to children, many schools nowadays provide a community provision and thus mother and toddler, disabled and elderly groups may also have their lives disrupted.

The Arson Prevention Bureau, a national organisation representing insurers, police and fire services, estimates that fires in schools costs the UK £100 million each year with an average of 20 schools suffering a major fire every week. The current level of fires in schools is 17% up on previous years.

For extra passive fire protection to be successful it will mean that particular attention should be paid to containing any fire within the compartment in

> *The Arson Prevention Bureau, a national organisation representing insurers, police and fire services, estimates that fires in schools costs the UK £100 million each year with an average of 20 schools suffering a major fire every week.*



Picture courtesy of ASFP

which it started. Compartment walls and floors are specifically intended to ensure that fire is not allowed to spread horizontally or vertically through a building.

The compartmented structure provides demarcated lines of safety for fire-fighters and occupants. The allowable size of a compartment will vary with the height and use of a building, the fire load contained in the building and the ability of fire-fighters to intervene effectively. Any compartment wall below a service void should run continuously up through the void to prevent the spread of fire through the void. Where the void is a roof void, the wall should reach roof level, or pass through the roof to a specified height to prevent spread of fire across the roof. The junctions of compartment walls or floors with each other, with external walls, or roofs, must provide continuity of the expected fire-resisting performance.

Any element (including structural elements) passing through compartment walls or floors should have associated fire-stopping at the point of penetration and the aperture should be kept as small as practicable. The design should ensure that the failure of a penetrating structure, because of fire in one compartment, will not cause failure in the adjacent compartment. The same comment applies to the passage of building services and special provisions are required for protected shafts.

But where should the designer look for the type of information that will allow him or her to add in the extra level of passive fire protection to benefit the fire-fighters and to preserve the building for a longer period of time? Well, the Fire Protection Association (FPA) publishes the Loss Prevention Council's 'Design Guide for the Fire Protection of Buildings'. And this is an invaluable source of information for those who wish to design their buildings to a higher standard than is required by the Building Regulations. The principal objective of this document is:

"To provide those most closely concerned with the design and construction of industrial and commercial buildings with expert guidance and information which will enable them to plan and build premises which are inherently safer from the fire hazard".

Buildings designed using the parameters of the guide will cope better in the event of fire. Any fire that does break out "will probably be confined to one compartment of the building, because of the Guide's provisions on compartmentation" and will "result in less damage from flames and smoke".

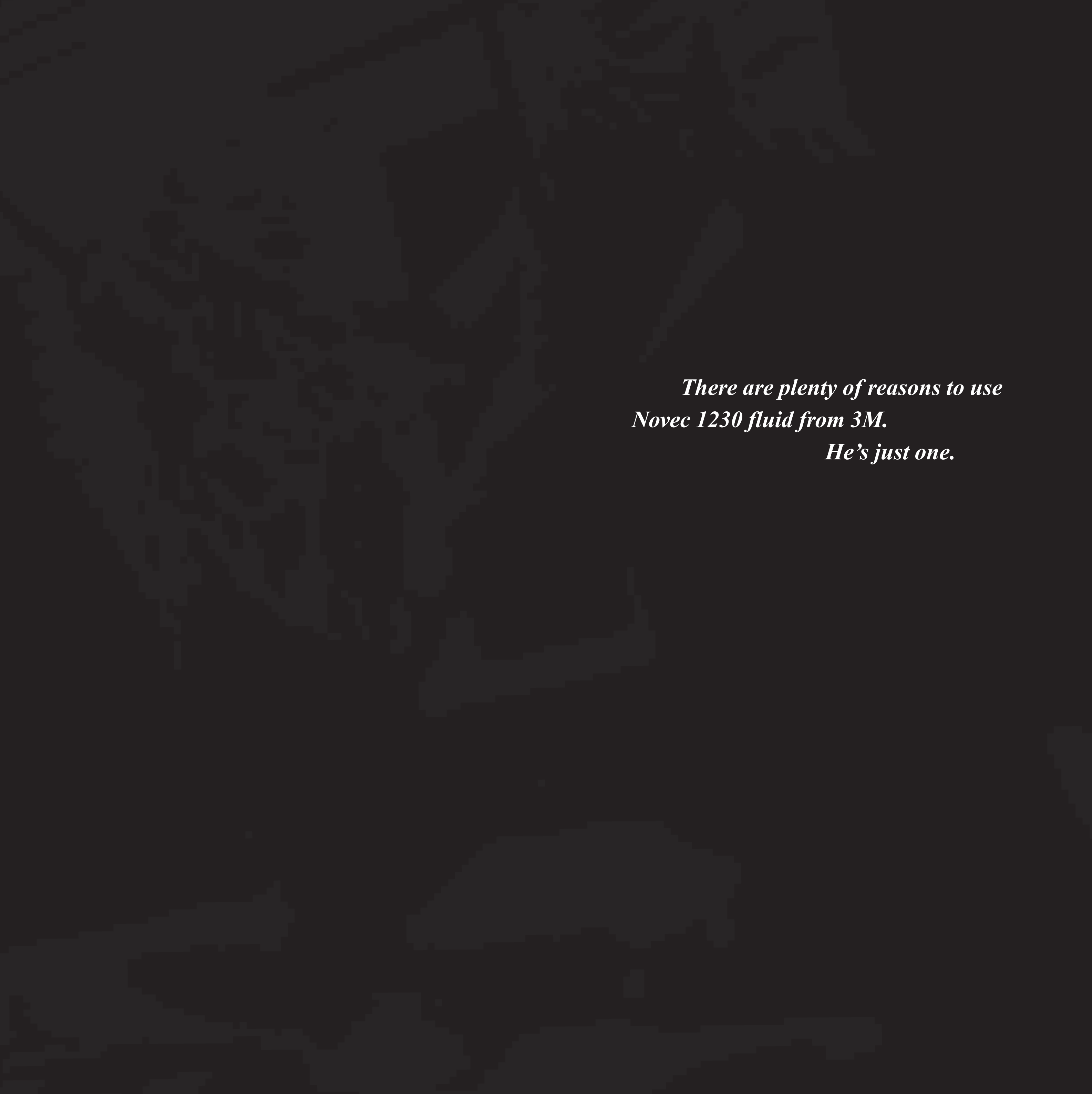
But how much extra passive fire protection does the LPC Design Guide ask for in comparison to Approved Document B of the Building Regulations? This varies by the type of building, but for schools the guide recommends that compartment walls have 120 minutes fire resistance while Approved Document B recommends minimum periods of 30, 60, 90 and 120 minutes depending upon its location in the building. The Design Guide also suggests in (some cases) more restrictions on the size of a building's compartments than does Approved Document B.

But whilst its all very well specifying an increased level of passive fire protection for a building, it is necessary to ensure that the systems are properly installed and maintained. At the end of the relevant phase of construction, the passive fire protection installer will issue a Certificate of Conformity, which will claim that the product has been installed in accordance with the terms of the contract. But what does the Certificate of Conformity mean? Is it worth the paper it's written upon? In the ASFP's view its worth is greatly enhanced if it is issued under the auspices of a third party accreditation scheme. Such schemes mean that competent operatives have correctly installed the specified products and that independent inspectors have randomly inspected the work.

Third party accreditation schemes were implemented to improve the quality of the UK's passive fire protection. Approved Document B of the Building Regulations states that 'Since the fire performance of a product, component or structure is dependent upon satisfactory site installation and maintenance, independent schemes of certification and registration of installers will provide confidence in the appropriate standard of workmanship being provided'.

The ASFP believes that designers should consider the use of more passive fire protection in buildings that are critical to the community, such as schools and hospitals etc. The value to the community of keeping these buildings operational far outweighs the small additional cost of an extra level of passive fire protection.

So, go on, go that extra mile. . . .



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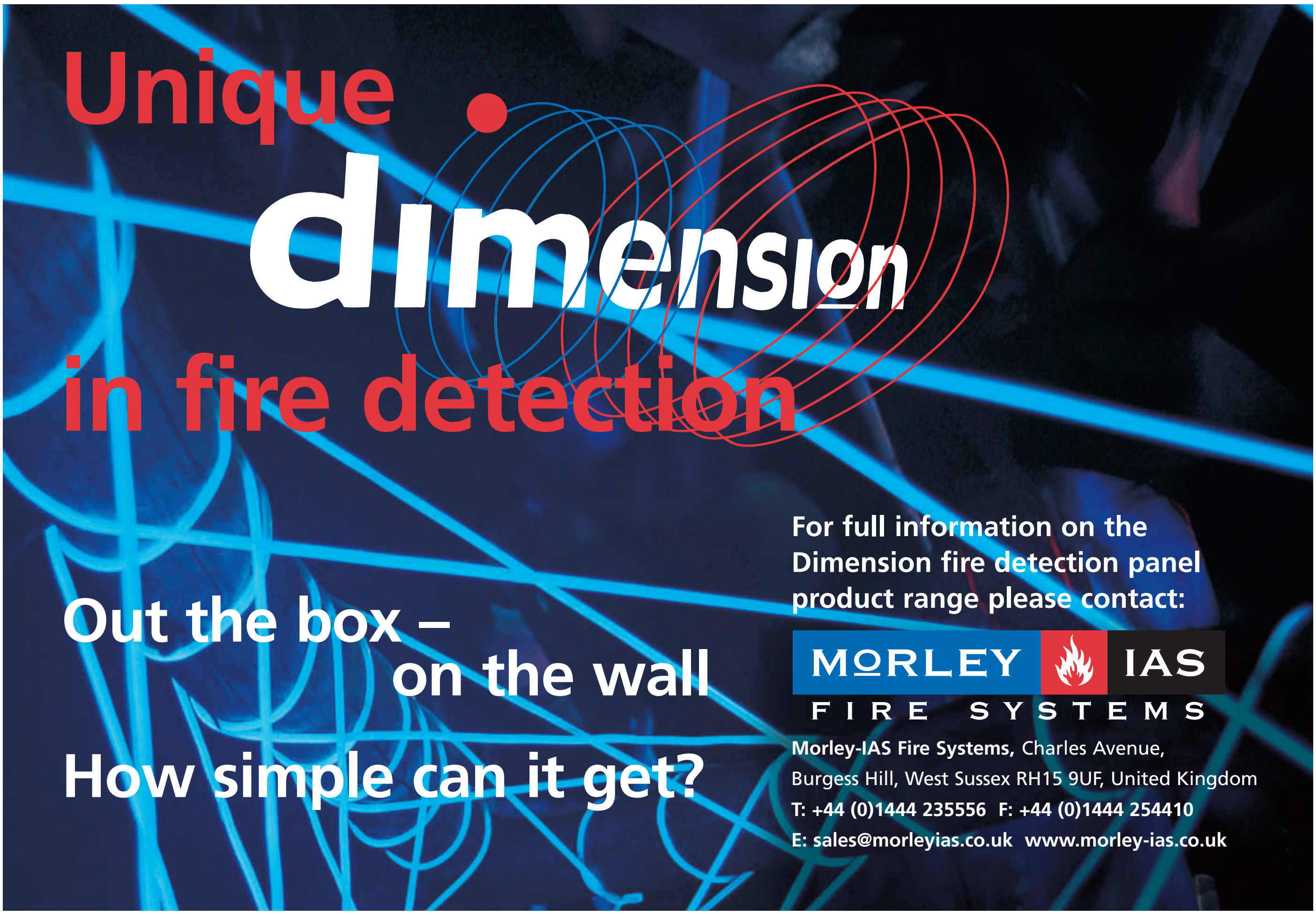


Enquiries: www.morley-ias.co.uk

ALARM PANEL ROUND-UP

AMPAC EUROPE – THE REVOLUTION HAS BEGUN

Ampac Europe specialises in the design, manufacture and distribution of technologically advanced fire detection systems. Ampac's systems are designed in-house, and protect life and property in commercial and industrial buildings.

"Our aim is to provide 'Consistently Excellent Service' in the eyes of our customers"

ZoneSense is a new 2 or 4 zone conventional Fire Alarm Control Panel. Each zone has the ability to be programmed in a number of different modes, providing the user with flexibility to meet any installation requirement.

ZoneSense PLUS is the most versatile 4 or 8 zone conventional Fire Alarm Control Panel available today. The user friendly navigation system provides simple operation during an emergency while also enabling complex cause and effect programming to be undertaken. A range of modular fast fit kits allows the panel to be professionally tailored to the requirements of each installation. This means small conventional panels can now be used in a wider range of applications.

For more information please contact:
Ampac Europe Ltd
Tel: 44(0) 1254 880 201
Fax: 44(0) 1254 880 201
E-mail: info@ampac.net

C-TEC GET LPCB APPROVAL

C-TEC's CFP conventional fire panel has been tested and approved as meeting EN54 Parts 2 and 4 by the Loss Prevention Certification Board (LPCB).

To achieve this accreditation the panel was submitted to extensive testing by the Loss Prevention Council to verify it met all of the relevant EN54 clauses concerning functionality and performance.

The successful conclusion of these tests has resulted in three LPCB approved fire panels being added to C-TEC's portfolio – a two, a four and an eight zone version. All three are now available ex-stock with the following user and installer friendly features:

- Class Change and Alert inputs
- Auxiliary fault, reset, remote and auxiliary outputs
- Four conventional sounder circuits
- Programmable delay, zone test and comprehensive fault diagnostic features
- Push button access code entry to access levels 2 and 3
- An attractive flush or surface mountable plastic lid and enclosure

For over 150 years, the LPCB and it's predecessor, the FOC (Fire Officer's Council), have been working with suppliers, specifiers, regulators and insurers to set the standards necessary to ensure that fire and security products are fit for their intended purpose. In addition to the successful accreditation of C-TEC's CFP fire panel, the company's ISO9001 quality accreditation system has been accredited by the LPCB since 1994.

For more information please contact:
C-TEC
Tel: + 44 (0)1942 322744
Fax: + 44(0)1942 829867
E-mail: sales@c-tec.co.uk

EDWARDS SYSTEMS TECHNOLOGY– NEW FIRE ALARM CONTROL PANELS OFFER THE BEST OF BOTH WORLDS

A new line of fire alarm control panels from **Edwards Systems Technology, Inc. (EST)** liberates small and medium-sized buildings from the all-or-nothing approach to system design.

With options that support both up to 8 addressable and up to 48 conventional detection and notification circuits, QuickStart lives up to its name in every respect. QuickStart lets you choose one of three easy programming methods: EST's exclusive auto-learn routine, front panel programming, or the PC based site configuration software. The auto-learn routine combined with its built-in scanner port ensures a fast, trouble-free installation every time.

With QuickStart's support for both Intelligent and Conventional detection, retrofit applications can now enjoy the best of both worlds for upgrading a system all at once or in phased stages. Utilising EST's Signature or EA Series addressable devices – meaning that in most cases the existing wiring can be used – you can save further on installation and cabling.

In addition to QuickStart's fast response times, the Fail-Safe mode provides even further reliability by ensuring the system will always be able to activate its signals and Auto Dialler in the event of an alarm – even if the CPU loses communication with other modules in the cabinet.

New or retrofit, QuickStart's application flexibility and ease of operation make it an ideal choice for schools, apartment building, hospitals, office building and retail facilities. Easy to install, simple to set up, and rock-solid when it comes to performance, QuickStart control panels are an installer's dream and a building owner's delight.

For more information on **EST** products and innovations visit their website at www.estinternational.com

KIDDE FIRE PROTECTION'S VEGA FIRE ALARM CONTROL PANEL

Based on a modular concept which enables the tailoring of system design for the smallest to the largest systems.

Designed to comply with EN54 Parts 2 & 4, Vega represents the ultimate in analogue addressable detection & alarm technology. Vega's distributed intelligence offers flexibility in design and operation; versions are available to support Apollo Discovery and XP95; and Hochiki ESP protocols.

The Vega panel has the capacity for expansion from 1 to 16 loops in single loop increments. Each loop is fully monitored and supports the relevant range of devices. An easy to read 8 line, 40 character text and graphical display allows ease of programming and user interface.

For more information please contact:
Kidde Fire Protection
Tel: +44(0)1844 265 003
Fax: + 44 (0)1844 265156
Website: www.kfp.co.uk

GE INTERLOGIX KILSEN – NEW PANELS TO MEET ANY REQUIREMENT

KSA701

GE Interlogix Kilsen has expanded its range of fire alarm control panels. These new additions place Kilsen amongst the leading manufacturers in the European fire detection business.

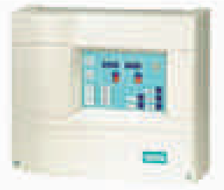
The analogue addressable series benefits from the introduction of the new KSA701/1 and KSA701/2, one and two loop analogue addressable control panels.

The KSA701 completes the KSA700 series (see chart), bridging the gap between the large conventional and mid-sized analogue addressable systems. Amongst other features, the panels have a capacity of 250 addresses per loop, a standard RS232 and an optional RS485 communication port. And all this on only one compact motherboard! These panels are aimed at small to medium sized installations where advanced technology in fire detection is an essential requirement.

The KSA702 and KSA705 remains the standard product for larger installation projects that require greater flexibility with additional options like built-in printer facilities, panel expansion etc.

The NK700 series 2 to 16 zone conventional fire panels with a new 3 and 6 zone gas extinguishing panels replace the existing NK600 conventional fire panel series. The NK700 series have been designed and manufactured to comply with European standards and has approvals pending. They offer yet another step forward in conventional panel design and operation. Two of the models are designed for

NK704



NK706

the control of 1 or 2 extinguishing zones, providing all the necessary inputs and outputs for monitoring and control of these extinguishing areas.

The flexibility of all the new panels is further enhanced with more than 10 different peripheral modules that fulfil every possible requirement for the complete protection of any premises.

With these new products in the range, Kilsen offers its customers a solution for every fire detection requirement.

For more information please contact:
GE Interlogix Kilsen
Tel : +34 934 809070

NEW FIRE DETECTION & ALARM PANELS LAUNCHED BY MACRON

New Hygood-brand conventional, extinguishing and analogue addressable control panels have been launched by **Macron.**

Two conventional panels are for smaller systems. Hygood Z Series is for the most basic FDA needs, while the LPCB-approved Hygood ZX Series is for more demanding applications. The Hygood DK Series extinguishing panel is purpose-built for gas and water pre-action systems.

The analogue addressable offering includes five panels. The Hygood VL Series is a fully networkable one to two-loop panel for smaller installations that is compatible with Apollo XP95 and DL protocols. Hygood XL Series is also a one to two-loop panel that is compatible with Apollo XL protocols.

Hygood DL Series is a fully networkable, LPCB-approved one to four-loop panel that is compatible with Apollo XP95 and DL protocols, while Hygood NL Series, a one to eight-loop panel, is for use with the XP95 protocol. Hygood HP900, a two to eight-loop panel, is intended for use with the Hochiki ESP protocol.

For more information please contact:
Macron Safety Systems (UK) Ltd
Tel: +44 (0)1483 572222
Fax: +44(0)1483 302180

DIMENSION – "OUT THE BOX ON THE WALL"

Launched at Fire Expo 2003, May 2003, UK, the new Dimension range of control panels from **Morley-IAS Fire Systems** offer simplicity and reliability for both the installer and the end user. All supported open protocols – Apollo Xplorer, XP95 and Discovery, Hochiki ESP, System Sensor Europe and Morley-IAS – are held in non-volatile memory, so once the field wiring is connected, commissioning is a simple matter of selecting the appropriate protocol, implementing the "autolearn" function and then pressing "reset" to accept the configuration. The panel is then fully operational.

Coming in 1, 2 and 4 loop configurations with up to 500mA per loop and a capability of 40 fire and 40 non-fire zones, Dimension is ideally suited for use in medium-sized installations such as offices, schools, health centres, retail units and leisure centres to name but a few applications. Dimension provides users with optimised protection by providing a comprehensive false alarm management package which, when combined with device specific text and programmable function keys, allows for a highly sophisticated solution which is simple to use.

Dimension is also designed with the installer in mind, housed in a physically compact metal enclosure; it can be flush or surface mounted. There is also a range of optional power supplies and an internal printer, all of which are pre-configured and tested before they leave the factory. This therefore gives the installer the true "out the box on the wall" solution, nothing could be simpler.

For more information please contact:
Morley-IAS Fire Systems
Tel: + 44 (0)1444 235556
fax: + 44 (0)1444 254410
Website: www.morley-ias.co.uk

UPDATE FOR 800 DEVICE PER LOOP SYSTEM

The Sita 200 plus Addressable Fire Detection System, from **Rafiki Protection Ltd**, can accommodate up to 200 'Multipoint' multi-mode fire detectors with built-in sounder, isolator and I/O to provide an unparalleled 800 devices per loop. This unique approach, unmatched in the marketplace, provides significant cost savings for every application. The specification of the system has been further boosted with a major upgrade to the control panel features including; full control over inputs and outputs built into the Multipoint detector, enhanced event log, extended disable feature and enhanced zone/system tests. The Sita 200 plus control panel provides a simple to use interface with a full set of programmable features.

The intelligent 'Multipoint' detector has 15 modes of operation, selectable from the panel, covering smoke, heat and combined sensing. This enables just one device to cater for all fire detection situations, a great advantage for design, stock holding and maintenance. The built-in intelligence of each detector allows for continuous self-calibration with early warning of contamination, this coupled with a disposable optical chamber, reduces maintenance costs. With its built in isolator and I/O and optional full specification 92dbA sounder, the 'Multipoint' detector provides the system designer with unparalleled flexibility.

A 2-wire version of the 'Multipoint' detector is also used in the 'Twinflex' system, bringing multi-mode capability and all of its advantages to 2-wire radial fire detection systems.

For more information please contact:
Rafiki Protection Ltd
Tel: +44 (0) 1633 865558
Fax: +44 (0) 1633 866656
Website: www.rafikiprotection.com

REDUCING FALSE CALLS WITH NEW SIEMENS FIRE PANEL

Siemens Building Technologies Ltd Fire & Security Products Division (FSP) have introduced a new series of fire alarm control panels specifically designed to reduce the number of unwanted Fire Brigade call outs.

Available in 2, 4, 8, and 12 zone versions, the FC500C features Siemens proprietary 'Brigade Delay Concept', which allows the system to operate in two distinct modes – manned and unmanned.

Whilst in manned mode, zones can be programmed to operate the sounders only, giving the user time to identify and investigate the alarm before the Fire Brigade are called: if a Manual Call Point initiates the alarm the Brigade is called immediately. In unmanned mode, if any detector or Call Point is activated then the Fire Brigade are called straight way.

The FC500C offers many capabilities that may seem unconventional in conventional fire alarm control panels. Additional functions and features include; zone, sounder and brigade/more isolate, code or key switch access, zones programmable for detector type, non latch zone option, fire/fault outputs, alarm verification option plus many other features.

The new FC500C series has a Safe & Easy theme being particularly simple for the end-user to operate, offering effective protection, both night and day.

For more information please contact:
Siemens Building Technologies Limited
Tel: +44 (0) 1784 461616
Fax: +44 (0)1784 464646
E-mail: rob.yates@gb.sibt.com

SILENT KNIGHT DEBUTS 50 POINT ADDRESSABLE FACP

Silent Knight introduces the IntelliKnight Model 5700, a 50 point class leading single loop addressable fire alarm control/communicator system that provides you with the revolutionary value and performance of addressable sensing technology combined with exclusive, built-in digital communication, distributed intelligent power, and easy to use interface. Powerful features such as drift compensation and maintenance alert are delivered to this powerful FACP from Silent Knight.

For more information please contact:
Silent Knight
Tel: +1 612 493 6400
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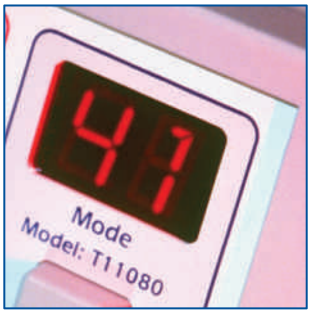
The Intelligent Solution for Conventional Fire Alarm Control Panels



Panel Features

- *Fully compliant with, tested and certified to EN54-2 & EN54-4*
- *4-wire conventional systems available with 2, 4 or 8 zones*
- *2-wire systems available with 2, 4 or 8 zones*
- *Compatible for use on BS5839: Part 1: 2002 installations*
- *2-wire repeaters and ancillary boards*
- *Simple, single board construction*
- *Installer friendly*
- *Compatible with wide range of detection devices*
- *Two monitored sounder outputs*
- *3 Amp power supply*
- *Auxiliary power output*

Programmable Functions

- *Adjustable sounder delay time*
- *Sounder configuration options*
- *Zonal sounder delay detectors only*
- *Zonal sounder delay call points only*
- *I.S Barrier selection by zone*
- *Short circuit fire by zone*
- *Non latching zones*
- *Silent zones*
- *Zone input delay*
- *General panel configuration*

Contact us for further details and pricing!

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Enquiries: www.kentec.co.uk

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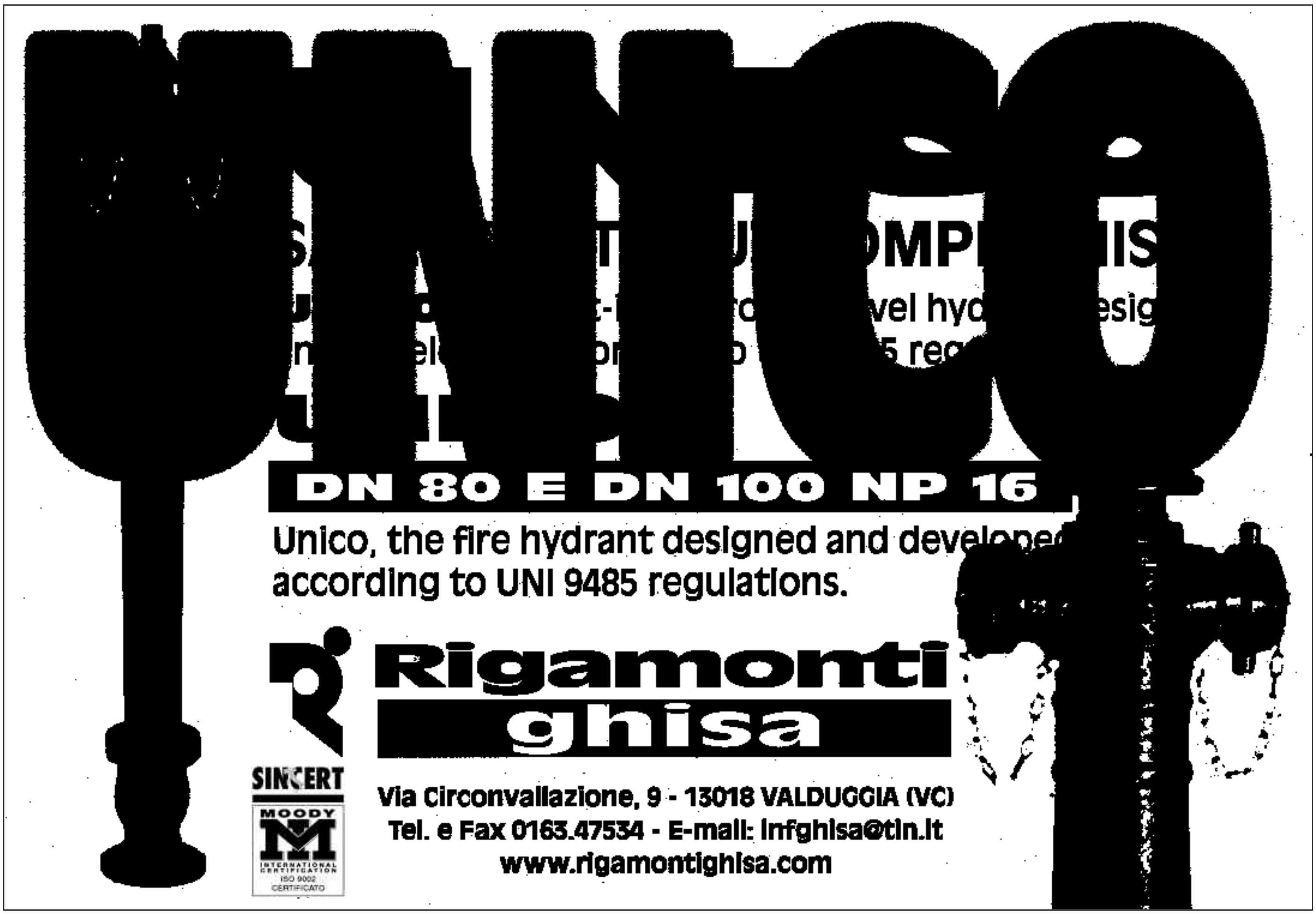

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Intumescent Coatings

By Dr Bill Allen
of Leigh's Paints

Fire Resistance Beyond the Requirements of Building Regulations

Picture courtesy of Leigh's Paints

THE BUILDING REGULATIONS for England and Wales, Approved Document B, titled Fire Safety states "The building shall be designed and constructed such that, in the event of a fire, it will maintain its stability for a reasonable period". What is a reasonable period?

The same document gives fire resistance periods in terms of building height and use. These vary from 30 to 120 minutes and also can depend on whether sprinklers (active fire protection) are installed in the building. The fire resistance periods are achieved by applying insulating products (passive fire protection) to the structural steel members in the building. These materials have to satisfy the requirements of BS 476 Part 21 Fire Testing Standard for the period designated by Approved Document B. Essentially this involves testing loaded and unloaded steel columns and beams at a NAMAS approved laboratory. The fire test regime is based on a standard cellulosic fire in a furnace where the rate of temperature rise is controlled to meet the standard heating curve. The fire test results are then assessed and the thickness of passive fire protection required for each steel section is determined. One important class of fire protection materials frequently favoured by architects and designers are Intumescent Coatings.

Intumescent coatings react in fire situations swelling to many times their original thickness to produce an insulating char or foam. This char reduces the rate of temperature rise in the steel thus increasing the time taken to reach structural failure.

There is currently no legislative requirement within the UK for structural steel assemblies (where gas, oil and chemicals are not a hazard) to carry out any further testing beyond the requirements of the Building Regulations. Specifically there is no requirement for any testing or approval against the effects of explosion and/or hydrocarbon fire. The writer also believes that a similar situation prevails in the rest of Europe and the USA, where only cellulosic fire testing is required to the appropriate National Standard.

Since the events at the World Trade Centre in New York on September 11th 2001 many questions have been asked about the fire protection of tall buildings around the world. In order to provide an additional level of confidence and to address some of these questions in advance of any specific requirements, Leigh's Paints have subjected a number of Firetex intumescent coatings to explosion and hydrocarbon fire.

In the event that an explosion precedes a fire, to fulfil its role in protecting the underlying structure from a fire, the intumescent coating must remain intact and well adhered both during and after the explosion. Therefore Leigh's Paints contracted Advantica Technology (formerly British Gas Technology) to conduct a gas explosion experiment to evaluate the resistance of thin film intumescent coatings to the explosion.

In addition to the above experiments Leigh's were invited to place a steel column section coated with Firetex intumescent inside a fire compartment in a multi-storey test building at the Building Research Establishment in Cardington. This section of the building was then subjected to a severe natural fire exposure. The performance of this intumescent-coated steel section is also reported in this paper.

GAS EXPLOSION EXPERIMENT

The explosion experiment was carried out on a number of I-section columns coated with Firetex intumescent materials in an 182m^2 explosion chamber. The average peak over-pressure of 1697mbar was generated with an average duration of 104msec.

There was no sign of damage to any of the specimens due to the over-pressure generated by the gas explosion.

The experiment was conducted using an explosion chamber at the Advantica, Spadeadam Test Facility. The explosion

Picture courtesy of Leigh's Paints

chamber measures 4.5m x 4.5m in cross section and 9.0m in length. The chamber has a vent opening on one of the 4.5m square faces, with all other faces being confined.

The explosion over-pressure produced is adjusted by varying two parameters, congestion and vent area.

Congestion in the explosion chamber is controlled by positioning banks of 0.18m diameter pipes horizontally, with up to 10 pipes per bank and a maximum of eight banks. Increasing the number of pipes increases the congestion, which in turn has the effect of increasing the magnitude of the over-pressures generated in the experiment.

The area of the vent opening at the end of the chamber can also be varied. Reducing the vent size, while retaining the same internal congestion of pipes, has the effect of increasing the duration and the magnitude of the over-pressure profile.

In this experiment there were 54 pipes and the vent area was less than $10m^2$.

Four universal columns 254 x 254 x 132Kg each 1.6m in length were positioned horizontally in the vent opening frame. The four beams were coated with 1.8mm Firetex M78, 1.5mm Firetex FB120, 1.8mm Firetex M782 and, 1.2mm of Firetex F908 respectively. The materials were all applied by airless spray.

When the installation of the test specimens had been completed, the vent opening was covered with 500 gauge (0.125mm thick) polythene sheet in order to retain the flammable mixture within the test rig.

The explosion chamber was then purged with the desired mixture of natural gas and air, both of which were controlled independently until the required gas concentration was achieved. The natural gas concentration was measured at four locations using infrared analysers to ensure a uniform concentration had been achieved.

The test was ignited by a single low energy spark positioned at the back of the chamber opposite the vent opening and behind the banks of pipes.

Pressure transducers were used to measure the over-pressure in the test rig, and video cameras were used to provide visual records of the test.

The average over-pressure measured by the pressure transducers was 1697mbar, with an average duration of 104msec.

When inspected visually post-test there was no sign of damage to any of the specimens due to the over-pressure generated by the explosion and the coatings were intact. These tests are reported fully in Advantica Report No. 5539.

This then poses the question; how would other fire protection materials perform in similar explosion conditions, and would the material retention be sufficient to offer adequate fire protection?

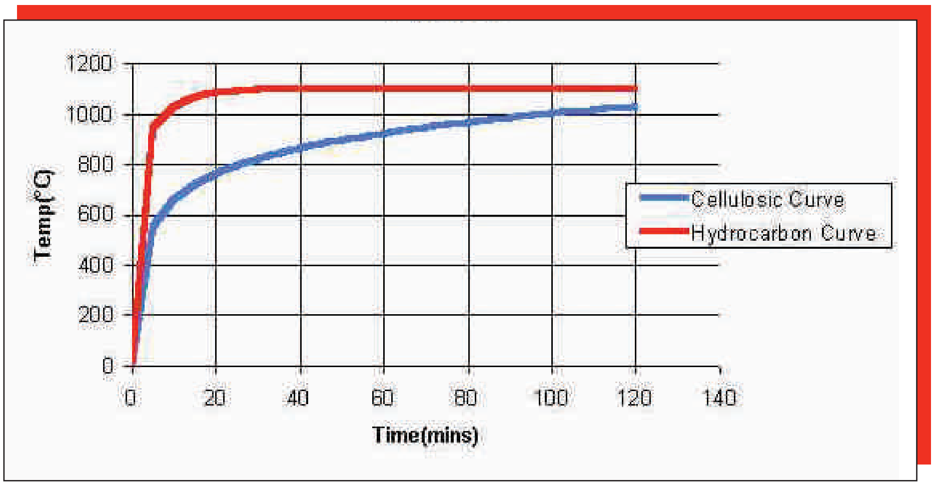
Following this experiment the test specimens were to further undergo hydrocarbon fire testing at a different facility. To ensure the samples from this test were those used in the later fire tests, each test specimen was signed and dated by an independent witness from Warrington Fire Research who also witnessed the explosion experiment.

HYDROCARBON FIRE TESTING

Thermocouples were fitted to the webs and flanges of each of the I-section beams that had been blast tested and also to identical control test specimens that had not been blast tested. The control sections were coated with the same intumescent materials at a dry film thickness within 5% of the blast test specimens.

The blast tested and control specimens were then subjected to a fire test which simulated the heating conditions specified in Appendix D of BS 476: Part 20: 1987. This appendix relates to a temperature relationship, which simulates fires burning hydrocarbon fuels. The graphs show the relationship between the specified hydrocarbon curve and the actual furnace temperature curve. You can also see as an example the comparative average steel temperatures of one of the blast test sections with its equivalent control section. All the Firetex intumescents performed similarly in the hydrocarbon fire test.

The steel temperature of the blast tested sample reached an average steel temperature of 550°C after 51 minutes and its equivalent control section after 53 minutes. It may therefore be considered that the influence of the gas explosion on the Firetex intumescent coating performance was negligible and did not prevent the coatings from providing a similar



On the whole in the hydrocarbon fire tests the materials achieved in the region of 60% of their expected performance in a cellulosic fire.

performance to that of the non-blast tested samples.

Hydrocarbon fires are generally much greater in severity than cellulosic fires, as can be seen when comparing the standard BS 476 Part 20 curves.

It should also be noted that the performance of these materials, which were designed for use in cellulosic fires, was still significant. On the whole in the hydrocarbon fire tests the materials achieved in the region of 60% of their expected performance in a cellulosic fire.

These fire tests were witnessed by an officer of Warrington Fire Research and are reported fully in Warres Report No. C128566.

PERFORMANCE OF FIRETEX M78 IN A LARGE-SCALE NATURAL FIRE

This report is concerned with the performance of an intumescent coating (Firetex M78) to a steel column section during a severe natural fire exposure. The performance in the natural fire is assessed against test data provided from a BS 476 Part 21 test on a similar section with a similar thickness of intumescent coating.

203x203UC52Kg column section 1m in length was protected was with an average intumescent coating thickness of 2.35mm. The indicative column was tested alongside other coated sections and is shown in place inside the fire compartment.

An identical unprotected section is included for direct comparison. Thermocouples were located on the web and either flange at the mid-height of the sections.

The compartment floor area was 11 metres by 7 metres and the height of the compartment was approximately 4m. Ventilation was provided from the window opening on the South face of the building. The original window height of 2.77m was reduced to 1.27m for the test to restrict the amount of oxygen available for combustion and therefore increase the duration of the fire. The compartment walls were built from plasterboard extending from the floor to a position approximately 500mm from the underside of the ceiling. The gap between the top of the wall and the underside of the composite floor was sealed with compressible fibre to allow for the anticipated large deformations of the floor above.

The fire was designed according to the parametric approach provided in the latest draft of the fire part of the Eurocode (BS EN 1991-1-2:2002, Eurocode 1: Actions on structures). The fire load consisted of 40kg of wood per square metre of floor area. This corresponds to a design fire load density of 720MJ/m^2 spread evenly across the compartment floor. The predicted response compared to the measured temperature is based on an opening factor ($A_v\sqrt{h}/A_t$) of 0.043m^{-1} and thermal properties of the compartment enclosure (b factor = $\sqrt{(\rho c \lambda)}$) = 714 J/m^{2}s$^{1/2}$K.

For a number of years the concept of time equivalence has been used to assess natural fire severity in terms of an

For protected steel sections this concept has been extensively validated and provides an indication of performance relative to a fire resistance period widely understood by designers and regulatory authorities.

equivalent period of exposure to a standard heating curve. The concept relates the maximum temperature achieved by a structural member in a natural fire to the time taken to reach the same temperature in a standard fire test. For protected steel sections this concept has been extensively validated and provides an indication of performance relative to a fire resistance period widely understood by designers and regulatory authorities. The time equivalence for this fire was calculated as 72 minutes. It was therefore considered appropriate to coat the steel column with a 90-minute fire protection thickness.

In this case the time equivalent value of the fire was closer to 100 minutes than the 72 minutes predicted. The unprotected section temperatures reached the so-called "critical" temperature less than 30 minutes while the average protected temperature remained blow this value for almost the entire duration of the test and only ever reached a temperature 10°C above this value.

The results indicated that a steel member protected in a similar manner to the indicative test specimen with Firetex M78 would have maintained load-bearing capacity for the entire duration of the natural fire and for a period corresponding to an equivalent fire severity of approximately 100 minutes.

The results of this fire test are reported fully in BRE Report No. 211576.

CONCLUDING REMARKS

In conclusion the above series of tests using Firetex intumescent coatings have demonstrated that they will provide protection against explosion and hydrocarbon fire in addition to severe natural cellulosic fires.

The author hopes that this paper will go some way to provide additional confidence in expertly formulated intumescent coatings when they have been subjected to far more than the statutory requirements of BS 476: Part 21.

Dr Bill Allen

LPG GROUP OF COMPANIES Launches its new NAF S 125® Systems

The definitive extinguishing agent

PROTECTING YOUR ENVIRONMENT?

NAF S 125® extinguishing agent has no effect on the Ozone layer and consequently its use is not limited or regulated by environmental regulations. As NAF S 125® is an extremely efficient extinguishant, it requires less gas by weight and therefore requires fewer cylinders to contain the agent. This in itself produces less impact on the environment as less energy is consumed in the equipment process.

TIME OF THE ESSENCE?

One of the first rules of fire-fighting is to extinguishing the fire in the quickest possible time since the more time is needed to knock down the fire, the more damage will be caused by the fire itself. In the past, the extraordinary popularity of Halon 1301 was mostly due to the exceptional speed of extinguishments, however, due to its environmental impact Halon 1301 is no longer used. Today NAF S 125® systems have the same performance of Halon 1301 systems, demonstrating speed of extinguishment and minimisation of damage to assets and humans.

SPACE AT THE PREMIUM?

Space is a precious resource to be used in the best way. In particular in those buildings where structural changes are difficult to achieve. NAF S 125® guarantees not only technically innovative solutions but also a significant saving in terms of space occupied.

GAMBLING YOUR INVESTMENT?

In any investment the assessment of the cost/benefit ratio is essential the choice of the most effective solution. In the past some of the popularity of Halon 1301 systems was due to the competitive cost of the low number of cylinders required. NAF S 125® not only is a technically advanced solution but also represents a significant saving thanks to a compact systems that also requires a low number of cylinders. This saving is also emphasised during the whole life of the systems due to the low cost of periodic maintenance of cylinders and valves.

PROPERTIES

NAF S 125® is physically similar to Halon 1301, thus it is an excellent and efficient alternative, with the advantage that it does not deplete the ozone layer.

STANDARD:
UNE 23571 : 2000
NFPA 2001 2000
ISO 14520

TECHNICAL DESCRIPTION:
HFC 125

DESIGN BASES (CLASS A FIRES):
Flooding factor: 0,485 kg/m^3
Design concentration: 8.7%
Filling density: 0.93 kg/100 l.

RECOMMENDED FOR:
- Occupied areas
- Electronic, computer, telecommunications equipment
- Files
- Museums
- High value goods

PRIMARY ADVANTAGES:
- A single 240 lt. cylinder containing 223 kg. protects risks up to 460 m^3.
- It is the most profitable HFC agent on the market.
- Excellent substitute for H-1301 (wide possibilities for use in existing pipes)
- Effective in low temperatures (≅–20°C)
- Leaves no residue after use.
- Reduction of decomposition by-products upon contact with the flames.
- Discharge in 10 seconds

It is suitable as an extinguishing agent in total flooding systems in occupied areas, protecting such goods as computers, archives, electrical and telecommunication equipment, among others.

Studies carried out according to the PBPK model (physiologically based pharmacokinetic model), included in NFPA 2001, have shown that human exposure to NAF S 125® for a maximum time period of 5 minutes and to concentrations up to 11.5% v/v, does not produce a level of NAF S 125® in the blood associated with a cardiac sensitisation.

Due to its low boiling point it is also appropriate for use at low temperatures. It is a colourless, odourless, non conductive gas.

It extinguishes fire by absorbing heat and leaves no residue to clean up after its use.

The typical design concentration of LPG's NAF S 125® systems is 8.7%, with a discharge time of 10 seconds.

Discharge is performed through valves fully developed by LPG, approved by the most renowned independent organizations. They offer great adaptability for all actuation and release systems currently used in the market, even allowing combinations of several of them. The design of the system protects against accidental actuation due to any small leak. They also allow checking and maintenance of all critical elements contained in a fixed extinguishing system, at the time of commissioning and later for system preventive maintenance, thus preventing the risk of accidental discharge.

CERTIFICATIONS

LPG systems and components for HFC-125/NAF S 125® are certified by the LPCB (Loss Prevention Certification Board) of England. LPG is currently working with UL towards Listing.

For more information please contact:

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NAF S 125® is a product of SAFETY HI-TECH

Halon Disposal Options

Meeting the EC Deadline

By Richard Marcus of Remtec International

Picture courtesy of Remtec International

AS MOST FIRE PROFESSIONALS ARE WELL AWARE, within the Economic Union (EU) restrictions have been instituted by European Community (EC) Regulation No. 2037/2000 concerning Ozone Depleting Substances (ODS's). Applicable since October 1, 2000, this regulation affects Halon users, producers, suppliers, maintenance and servicing engineers. The EC regulation mandates decommissioning of fire protection systems and fire extinguishers containing Halons on or before December 31, 2003. The only exemption is Halon used in a limited number of "critical uses", for example, in certain military and aerospace applications. For a complete list of critical uses refer to EC Regulation, Annex VII*. Recently, the EC commission was contacted to see if there would be any flexibility regarding this deadline. The answer was a firm, no!

Assuming that the EC deadline is not extended, the removal of all Halon systems and portable fire extinguishers by December 31st is certainly a massive challenge, which will strain all available resources within the fire protection community. This is especially true in EU countries where the existing Halon inventory remaining in the field is still relatively large. Although alternative agents and systems are readily available, some fire protection professionals question whether all remaining Halon can be properly disposed and replaced with an appropriate alternative agent system within the proscribed time frame. Nevertheless, the prudent course of action is to assume that there will be no extensions and to plan accordingly. If you possess Halon, it is best to begin the decommissioning and disposal process as soon as possible. Even if the deadline is extended, the future of Halon is over in the EU and disposal will become more costly as demand for this service increases.

Although each EU member country may have additional restrictions, generally there are two practical options available to end users faced with the task of legally disposing of their unwanted Halons. The first is **destruction**, which is accomplished in the EU primarily through incineration, or plasma arc technology. Both are costly and take tremendous amounts of energy to completely destroy these stable chemical compounds, especially Halons. Also, there are other considerations the end user must examine when choosing this option. Ultimately, it is the responsibility of the end user to assure that Halon or ODS agents in their possession are disposed in accordance with accepted environmental standards.

Picture courtesy of Remtec International

DESTRUCTION OPTION

The Ozone Secretariat within the United Nations Environmental Programme (UNEP) has issued a handbook concerning "International Treaty on the Protection of the Ozone Layer – Section 2.4 – Destruction Procedures." The purpose of this document is to provide additional guidance (a Code of Practice) to facility operators, or anyone handling or involved with the destruction of Ozone Depleting Substances (ODS's). Although these recommendations are not law, it can be safely assumed that they are considered the environmentally correct way to decommission, handle and destroy Halons and other ODS agents. Those entities' destroying ODS's that don't follow these standards do so at their own peril. Therefore, it is important that all end users or holders of unwanted Halons should be aware of this code, and how halocarbons are to be properly disposed.

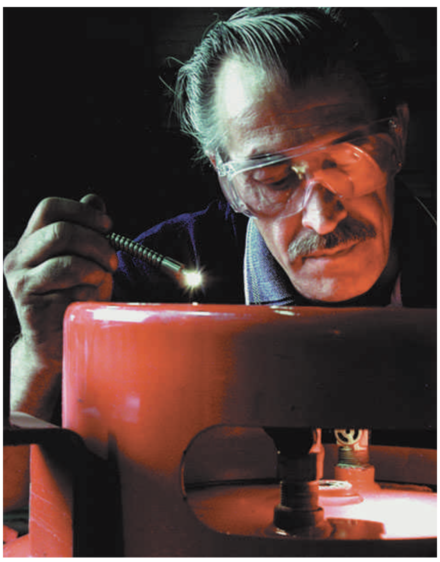
Used Halons are considered a hazardous waste product unless it is recycled and made useable for "critical use" as proscribed by the Montreal Protocol

Picture courtesy of Remtec International

Treaty. No matter which option is chosen, ultimately, the end user has responsibility to assure that the Halon in their possession is disposed of properly. It is not enough to contract with companies offering the lowest destruction price per kilogram, and assume that responsibility stops with a written certificate of destruction. The end user or holder of used Halon is still required to perform due diligence in order to reduce potential future legal liability.

The UNEP Handbook covers a number of areas involving the safe handling and destruction of Halons and other ODS materials, including what is considered approved destruction processes. The Handbook, however, also details specific areas of concern, including how ODS agents should be properly shipped, unloaded, tested, verified, storage procedures and stock control. Of particular concern is the facility design and its ability to destroy ODS materials within certain specific standards. According to the UNEP Handbook, “The destruction facility should be properly designed and constructed in accordance with the best standards of engineering and technology, and with particular regard to the need to minimize, if not eliminate, fugitive losses.”

The primary concern is that disposal does not result in an ODS ultimately finding its way to the atmosphere, either through neglect or intentional releases. To this end it is the responsibility of all parties associated with disposal to make sure that there is at least occasional independent verification and confirmation of data produced by the operators of the destruction facility. Information should be available to the end user and third party regulatory agencies, demonstrating that Halon shipped to the destruction facility has in fact been properly handled. Also, the UNEP Handbook suggests at a minimum that ODS destruction efficiency within an approved facility, as well as for other environmental releases, shall be validated at least once every 3 years. This includes establishing procedures involving the proper storage of ODS agents, training and on-going preventative maintenance programs. However, the area of critical importance is monitoring and measurement of ODS’s to the atmosphere. The UNEP Handbook further states, “Operators shall ensure that destruction processes are operated efficiently to ensure complete destruction of ODS’s to the extent that it is technically feasible for the approved process. This shall include the use of appropriate measurement devices and sampling techniques to monitor the operating parameters burn conditions, and mass concentrations of the pollutants that are generated by the process. . . . In addition, a site-specific test protocol should be prepared and made available for inspection by the appropriate regulatory authorities. The sampling protocol shall report the following data from each test: ODS feed rate, total halogen load in the waste stream, residence time of ODS registered above 850 degrees C, oxygen content in the flue gas, gas temperature in the combustion chamber, flue gas flow rate, carbon monoxide in the flue gas, effluent volumes and quantities of solid residues discharged, ODS concentrations in the effluent and solid residues, and concentration of PCDD/PCDF, dust, HCL, HF, and HBr in the flue gases.”



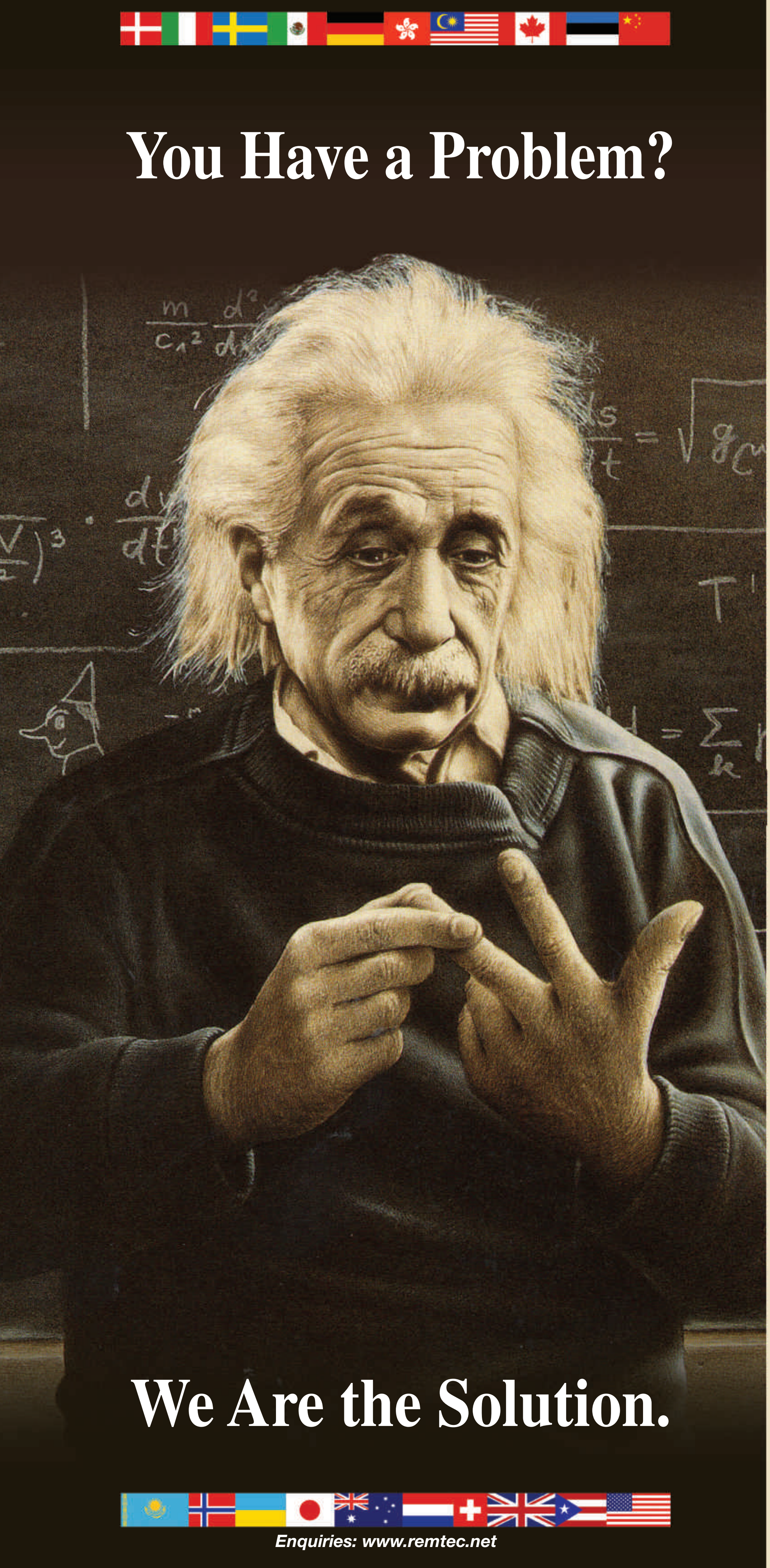
Picture courtesy of Remtec International

End users and holders of Halon have a responsibility to assure that if destruction is chosen as the disposal alternative, that it is done properly and is sent only to those facilities that can handle and destroy ODS agents in accordance with these and other guidelines discussed in greater detail within the “UNEP Handbook – Destruction Procedures.” The end user must assume a “cradle to grave” responsibility involving the proper disposal of these ODS hazardous materials.

HALON RECYCLING FOR “CRITICAL USE”

There is, however, an alternative available regarding Halon disposal. This alternative solution is cost effective and in accordance with the spirit of the Montreal Protocol and the new EC disposal regulations. Article 11(1)(d) of (EC) No. 2037/2000 permits exports of products and equipment containing Halon, provided they are exported to any country outside the European Community for specific “critical uses” list contained in Annex VII*. Article 11(1) of EU Regulation 2037 forbids the export of Halons, but it shall not apply to the export of controlled substances to satisfy critical uses. In further support, recycling for “critical uses” is encouraged by the Montreal Protocol in Article IV/26, which states that, “International recycled Halon bank management is to urge Parties to encourage recovery, recycling, and reclamation of Halons in order to meet the needs of all Parties . . .”

The approval process does require export permits, which serve several important functions. Primarily, the permit process has been instituted to assure all concerned parties connected with the transaction (including regulatory agencies) that the Halon is used material, and is recycled only to critical users as defined by Annex VII.


You Have a Problem?
We Are the Solution.
Enquiries: www.remtec.net

Picture courtesy of Remtec International

THE FIRST STEP in the process is to obtain a permit from the EC. Article 12 states, "that exports from the EU shall be subject to European Commission authorization by the European Commission for 12 month periods." A copy of each export authorization is forwarded to the competent authority of the member state that is the exporting country of origin. For further detailed information please contact the European Commission: Sabine Cardinal: sabine.cardinal@cec.eu.int (0032-2-29-68757), or Sindy Simon: sindy.simon@cec.eu.int (0032-2-29-96498)

THE SECOND STEP is to obtain an export permit from the country where the Halon resides (the country of origin). Although each country has its own laws and regulations, most EU members recognize the need to export Halon for critical uses. It is especially important to maintain good records regarding the history of the Halon and its use. It is also important to demonstrate that the Halon is destined for an approved critical use as defined in Annex VII.

THE LAST STEP is to obtain an import permit from the country where the critical user is located. Most critical users outside the EU reside in the United States, i.e., military, aerospace and petrochemical applications. The U.S. EPA is the regulatory agency responsible for issuing and approving import permits. Their primary concern is that the Halon is, in fact, used and that all export permits have been properly obtained from the country of origin. When making this application one can expect the U.S. EPA process to take up to 40 days and during this time detailed information will be required in order to successfully obtain a "None Objection Notice" (an import approval). Again, the more information that the end user provides in their application, (i.e., system bottle serial numbers, cylinder weights, and history of the installation), will enable U.S. regulatory authorities to respond in a timely manner and overall facilitate the application process.

Don't expect to obtain import permits for Halon 1211. Although the U.S. EPA allows Halon 1211 applications, there is still a sizeable Federal Tax due upon the initial sale after its importation into the U.S. Therefore, this tax makes it unfeasible to import Halon 1211, however there is no tax applicable involving Halon 1301 importation as long as it is determined to be recycled for critical use.

The export/import application process does require the principle parties involved in the transaction to provide key information about the Halon 1301 installation history and further critical use, but this process assures that the transaction is legitimate and thereby substantially reduces the risk of improper ODS disposal. And, when compared to the cost of destruction, the recycling of Halons for critical use is not only cost effective, but may prevent further production of virgin Halons in the future. It's environmentally the right thing to do!

No matter which option you choose it is important to only work with reputable companies that have successfully disposed of halocarbons in a safe and environmentally responsible manner. The choice is yours, although the December 31, 2003 deadline is quickly approaching, it is still important to proceed prudently.

Finally, there are certain EU member countries that either are in the process of severely restricting or completely banning HFC alternative agents that are now considered global warmers. In particular, the fire protection community has installed HFC-227 where a clean agent is required. This agent is known by several trade names. If local regulations prevent the further use of this or other HFC substances**, exporting to qualified users may also be a cost effective disposal option to consider.

*Annex VII, Critical Uses of Halon

- In aircraft for the protection of crew compartments, engine nacelles, cargo bays and dry bays.
- In military land vehicles and naval vessels for the protection of spaces occupied by personnel and engine compartments.
- For the making inert occupied spaces where flammable liquid and/or gas release could occur in the military and oil, gas and petrochemical sector, and in existing cargo ships.
- For the making inert of existing manned communication and command centres of the armed forces or others, essential for national security.
- For the making inert of spaces where there may be a risk of dispersion of radioactive matter.
- In the Channel Tunnel and associated installations and rolling stock.

**European HFC Status Update

- Draft EC Regulations on fluorinated gases proposed on June 12, 2003. Requires reporting data on the production, importation, export, recycling and destruction of fluorinated gases annually.
- Denmark – first comprehensive national law banning HFC's enacted July 1, 2003, most uses banned by 2007.
- Austria – bans HFC's for fire protection in 2003, many uses banned by 2008 to determine whether the phase out dates are feasible.
- Germany – Environmental Ministry issued a paper in October 2002 with initial proposals for HFC controls; options include use restrictions or bans. The Proposal was expected in June 2003, but may be delayed indefinitely.
- (Outside the EU) Norway – enacted a tax on imports of HFC's/PFC's of 180 NKr per ton (0.18 NKr per kg. CO2), for HFC-2 27ea tax would be 522 NKr per kg.
- (Outside the EU) Switzerland – Enacted ban in May 2003 on HFC's where substitutes exist.

Visual warning de emergency system

VISUAL SIGNALLING DEVICES, often referred to as strobes or beacons, are used extensively in emergency systems to alert people of danger, to indicate that a hazard is present or that a predefined condition has been detected. A primary rule is that a visual signal shall normally only be used in an emergency system as a reinforcement to an audible warning device, although they are, of course, widely used by themselves in industry to indicate machine state or environmental condition.

OPERATING TECHNOLOGIES – STRENGTHS AND WEAKNESSES

ROTATING BEACONS

Using either a tungsten or halogen bulb, or more recently an LED 'bulb', a parabolic reflector, driven by an electric motor, rotates around the light source on a vertical axis creating a powerful beam of light travelling through 360°. However, because of vibration, harsh conditions and extremes of temperature, these electro-mechanical units usually have a relatively short life; the current consumption of the bulb and motor is also high, making them relatively unattractive for most applications.

E2S Type BEx 15 Joule, auto synchronised beacon, Explosion Proof for hazardous locations

FILAMENT BULB

Control circuitry enables a blinking output to be achieved. Indicators using a filament bulb normally use a Fresnel lens to enhance the light output, giving adequate performance at a relatively low cost. Filament bulbs have quite a short life, further shortened when exposed to quite low levels of vibration. In general, a filament bulb beacon is of limited effectiveness and should normally be used only as an indicator rather than as an alarm beacon. It is the least expensive option and units are available in a wide range of physical dimensions, wattages and enclosure styles.

XENON (STROBE) TUBE

Operating at very high voltage generated by an inverter circuit, the Xenon gas in the tube breaks down, creating an instantaneous brilliant flash of light, normally enhanced by using a 'Fresnel' lens. The light energy of the flash is a function of the Xenon tube size, the voltage across it and the capacity of the capacitor discharging into it. The Xenon strobe beacon has the best light output to power input ratio and is the most widely used and versatile technology currently available. Tube life is critical: it may be as little as 1 million flashes in cheaper devices but specifiers should typically expect 5 to 8 million flashes from higher quality units.

LED (LIGHT EMITTING DIODE)

A semiconductor device, unlike the filament bulb and the Xenon tube emits only one frequency of light (i.e. one colour). LED technology is rapidly developing and while it does not as yet offer as bright an output as the Xenon tube, it does offer an extremely low current and very long life time, giving an effective solution where an indication or status is required. Once a quirky and expensive alternative, the emergence of ultra bright LEDs means the LED beacon has become a viable low current consumption, zero maintenance alternative to the Xenon strobe. It is particularly effective in Intrinsically Safe areas, where the necessary power input restrictions do not allow a Xenon strobe to function at anything like peak efficiency.

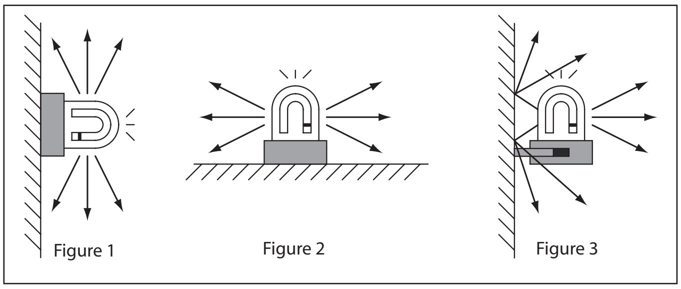
E2S Type L101 beacon, 5 Joule version for general alarm indication

LOCATING AN ALARM STROBE BEACON

Light travels in straight lines, so the beacon will be far more effective if positioned in the line of sight rather than relying on reflections. Where applicable, audible signals should always be the primary warning with the beacon used as a secondary alarm indication or status, generally the audible and visual indicators should be located

vices in s

by John Rattlidge
E2S – European Safety Systems



close together. All round light dispersion should be the first consideration when installing a beacon; ensuring free air movement to prevent the build up of excessive heat is also important and beacons should never be installed upside down. Wherever possible, vibration should be avoided.

Some larger types of Xenon beacon emit the light from the side rather than the top of the enclosure, so if wall mounted with the lens 90° to the wall as shown in figure 1, most of the effective light will be emitted up to the ceiling and down to the floor. Such devices should either be mounted directly to a horizontal surface (figure 2), or on a horizontal bracket from a wall, figure 3.

The beacon should be installed so as to ensure that the maximum light output is emitted over the desired area of coverage. The effective area of a beacon is a function of the Xenon tube shape – either straight or, more usually, horse-shoe-shaped as shown above – and the mounting angle of the lens.

BEACON EFFECTIVENESS AND RANGE

Xenon beacon manufacturers specify performance in a number of ways: probably the most common being Joules, a measure of the incident energy applied to the beacon tube. More meaningful is the peak and average output light emission measured in candela. "Brightness", often presented as polar plots is often used for more accurate, involved calculations and coverage predictions; it is referred to within product standards.

The perceived brightness of a beacon is dependent on the brightness of the light source, the lens colour of the unit and the ambient light level. A general indication of the effective

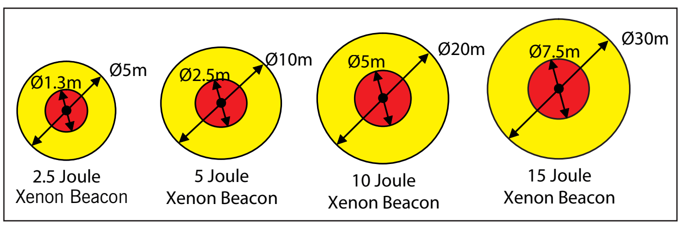


Figure 4

Light Source	Lens Colour	Clear	Yellow	Amber	Red	Blue	Green
Xenon	–	100%	93%	70%	23%	24%	25%
Filament	–	100%	95%	70%	17%	17%	12%

Figure 5

360° coverage for Xenon beacons with clear lens covers, installed in an industrial environment, is shown in figure 4. The inner circle defines the alarm distance where an observer's attention would be attracted if he was not looking in the general direction of the beacon; the outer circle the indication distance where an observer would be unlikely to see the emitted light if he was not looking in the general direction of the beacon.

The effect of lens colour on the perceived intensity of the light source within an industrial environment is quite significant (figure 5).

Finally, as a rule of thumb, the intensity of a beacon is reduced by 25% as the viewing distance is doubled.

Please note all the above information is for guidance only and does NOT guarantee performance or coverage.

ENVIRONMENTAL CONDITIONS INFLUENCING BEACON SELECTION

HAZARDOUS AREA USE

Intrinsically Safe Xenon tube strobes are of limited effectiveness due to the energy restrictions required by the intrinsically safe protection method; they are therefore little more than an indicator in most applications. The performance of Ultra Bright LEDs available to the beacon manufacturer means that Intrinsically Safe LED beacons are increasingly becoming the preferred choice, giving longer life, higher output and improved reliability than Xenon tube alternatives.

AMBIENT LIGHT LEVEL

In all applications, the worst case ambient light level must be considered and an effective beacon installed. The safety of people may well depend on the beacon's performance and the responsible designer and installer will ensure that the beacon is sufficiently powerful and that it is installed in a suitable location. The worst that can be done is simply installing the least expensive and most ineffective model because the regulations or standards simply demand 'a beacon'.

INGRESS PROTECTION/IP RATING

Most manufacturers offer high IP66 and IP67 rated beacons within their range. Be careful of over-specifying the degree of protection required; check the environmental requirements carefully.

ELECTRICAL CONSIDERATIONS

Rotating beacons, though effective, require high current; in many cases, a Xenon strobe or LED beacon will be a more attractive alternative. If the beacon is going to be controlled via a PLC (Programmable Logic Controller), then high inrush currents can generate induced transients, interfering with the PLC. A fully suppressed product will dramatically reduce the likelihood of such problems, particularly in multi beacon applications.

MECHANICAL CONSIDERATIONS

Is a lens guard required to protect against impact? Can the beacon be installed so that the observer will directly see the light output rather than reflections? Does the manufacturer supply suitable brackets to enable the optimum installation to be achieved?

SERVICEABILITY

A dirty beacon is ineffective; many faulty beacons dramatically start working again once a fully qualified, competent person has wiped them over with a damp cloth! However, if access for routine cleaning, particularly in a dirty environment, is difficult, the performance of the beacon will inevitably degrade with time.

LEDs have the longest life, second are Xenon tubes, and last are filament and halogen bulbs. Premature failures, particularly in filament bulbs, are often the result of mechanical vibration and shock. Some beacon manufacturers offer replacement Xenon tubes; normally it is sensible to replace the associated circuitry at the same time. Whichever light source is used, it should be protected and restrained in order to minimise the effects of vibration and thus offer the longest life in commercial and industrial applications. The mechanical design of the unit is another area where the low cost manufacturer will skimp, with predictably deleterious effects on reliability.

E2S Type L101L-IS beacon, Intrinsically Safe, ultra bright LED Array for Zone 0, 1 & 2 applications

STANDARDS AND APPROVALS RELATING TO VISUAL SIGNALLING DEVICES

There are many different standards either referring in whole or part to visual signals and beacons; the ones below cover industrial, fire and evacuation applications.

USA/CANADA

UL 1638 Visual Signal Appliances

Requirements include electrical safety, endurance and environmental tests, light output and dispersal tests; the specification distinguishes between fire alarm use and non-fire alarm general signalling use in both indoor and outdoor environments.

UL 1971 Signalling Devices for the Hearing Impaired

Adds minimum levels of light and dispersal within sleeping and non sleeping areas and synchronised flashing of visual signals within a fire alarm or evacuation system to the requirements of UL 1638.

EUROPE

A draft standard for beacons under the EN 54 series, equivalent to EN 54-3, Fire Detection and Fire Alarm Systems – Audible Fire Alarm Devices, will set out minimum environmental requirements and a means of defining the beacon manufacturer's declaration of output and performance.

E2S Type MB010, 10 Joule beacon IP67 & IP66 protected for harsh and exposed conditions

UNITED KINGDOM

PFEER, the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations.

These regulations state the person or company responsible for an installation is also responsible for protecting persons on the installation from fire and explosion and securing effective emergency response.

INTERNATIONAL

IEC 73 – Colours of luminous indicators & push buttons

This standard sets out the colours required to conform to the machine directive.

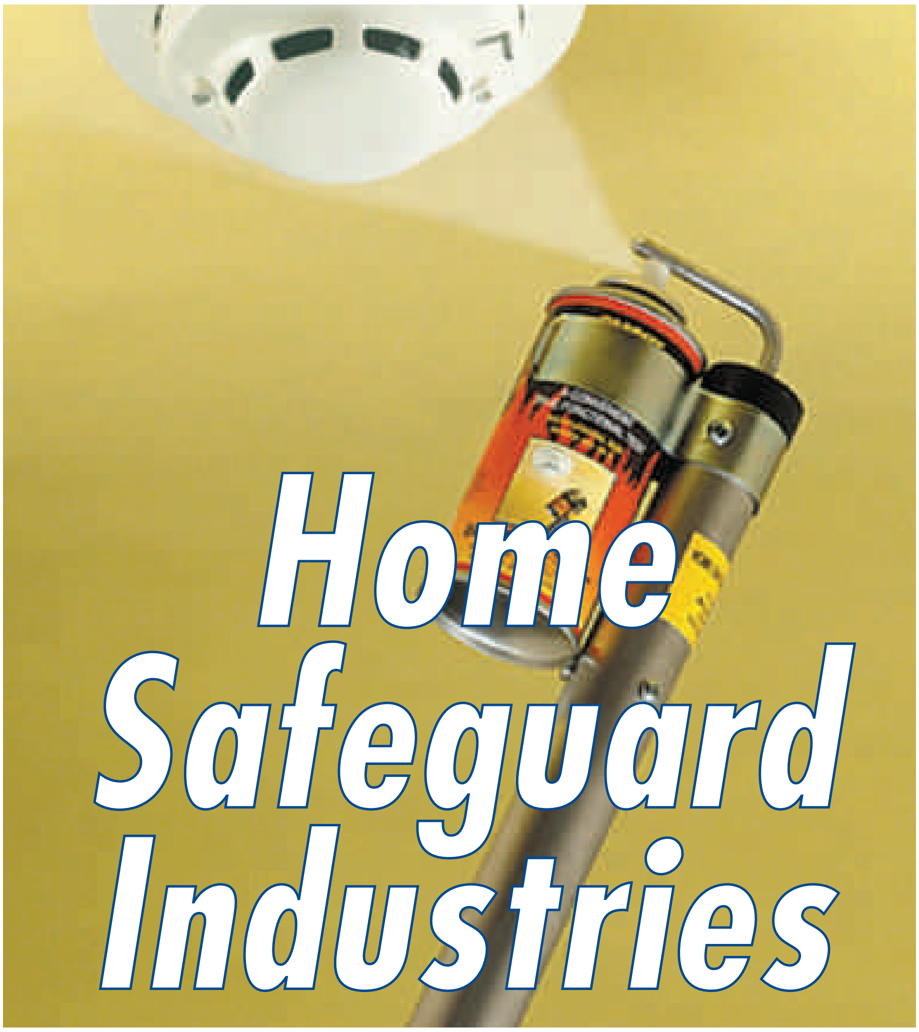
- **RED – Danger, Act Now.**
  - Danger of live or unguarded moving machinery or essential equipment in protected area.
- **AMBER – Warning, Proceed with Care**
  - Temperature or pressure different from normal level
- **GREEN – Safety Precaution: Go Ahead**
  - Checks complete, machine about to start
- **BLUE – Site Specified**
  - Pre-set ready or remote control
- **CLEAR – No specific Meaning**
  - Could confirm and earlier message

MARINE INDUSTRY

IMO – International Maritime Organisation Resolution A.686 (17), Code on Alarms and Indicators

Intended to provide general design guidance and to promote uniformity of type, location and priority for those alarms and indicators that are required by the 1974 SOLAS convention. The code applies to shipboard alarms and indicators on ships constructed on or after 1st July 1992 and on major modifications or new installations after this date.

John Rattlidge



Home Safeguard Industries

HOME SAFEGUARD INDUSTRIES is the world's leading manufacturer of aerosol smoke alarm testers. Since 1979, as the innovator of the first aerosol smoke tester, we've built a global presence serving the commercial fire alarm and security industries with our patented test tools and aerosols including Smoke Detector Tester™, Heat Detector Tester™ and related accessories.

Smoke Detector Tester™ **is UL Listed and approved by virtually all commercial alarm manufacturers for use on their detectors.** It is the most reliable, economical, and effective way to functionally test for smoke entry and meet NFPA 72 and local fire code test requirements.

Smoke Detector Tester™ has been used in literally tens of millions of tests and remains the preferred choice of fire safety experts worldwide. Smoke Detector Tester™ works with all smoke detector brands and types of optical or ionization detectors. Our patented, proven formula is safe on sensors, non toxic and 100% ozone safe., the aerosol is competitively priced and reduced transport costs. Smoke Detector Tester™ is manufactured

in Europe and available in two can sizes: our traditional 2.5 oz can (200+ sprays per can) or our **new 4.87 oz. size** (400 sprays per can). This latest can size was specifically designed for use in commonly used enclosed aerosol dispensers.

A variety of accessories are available for use **with** Smoke Detector Tester™ **including the UL Listed 1490 Spray Adapter.** Using the **1490** helps to better control the aerosol spray particularly in turbulent air conditions. The 18″ tube also keeps the aerosol at a safe distance from the detector eliminating a direct spray of the sensors.

Other accessories available include our unique test pole extension devices. The modular design lets you build the pole length that meets you specific needs. Our aluminum pole series provides a total extendable reach of over 30′ including height of technician. Our fiberglass pole series provides a total extendable reach of over 20′ including height of technician.

Another reliable test product is our Heat Detector Tester™ for testing all rate of rise and reat of rise/fixted temperature combination heat detectors in the 135-190 degrees range. Heat Detector Tester™ is **UL Listed.** The totally portable, lightweight tester uses an exclusive, disposable heat pad activated by a saline solution as the heat source that is safe, non-toxic, and cost effective. Now you can do away with ladders, heat guns, hair dryers, and costly and cumbersome battery back type units. Heat Detector Tester™ It is the perfect test system for every alarm installer and maintenance technician.

For a *free sample* of our new Smoke Detector Tester™ or for a referral to one of our European distributors, email us at expert@homesafeguard.com. Put Us To The Test Today!

For more information please contact:

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USA

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Fax +1 847 281 8998

www.homesafeguard.com

Ginge-Kerr Danmark A/S

Argonite® Fire Extinguishing System

Halon phase out - EC regulation 2037/2000 prohibits use of halons.

Since the early 90'ties Ginge-Kerr Danmark has developed Argonite systems available as 150 bar and 200 bar. In 2000 we launched the 300 bar Argonite system, based on a new valve concept which comply with the Pressure Equipment Directory (PED) and the Transport Pressure Equipment Directory (TPED).

The Argonite system is an environmentally friendly alternative to Halon, tested and approved by regulatory bodies throughout the world.

Argonite, inert gas systems

- Fast acting and effective against all fire hazards
- Safe for occupied areas
- Environmental neutral - zero ODP, zero GWP and zero atmospheric life time
- No post-fire residues or damage to protected equipment
- Available throughout the world

Argonite fire extinguishing system is engineered for single room protection or central bank system for protection of as many room as required, hence Argonite may be transported +300 meters. Do not waste time - check your local distributor on www.ginge-kerr.com

Argonite a safe and environmental friendly choice.

Now with LPCB Approval at 300 bar – it's better than ever.

Ginge-Kerr

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ISO 9001

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A Kidde Company

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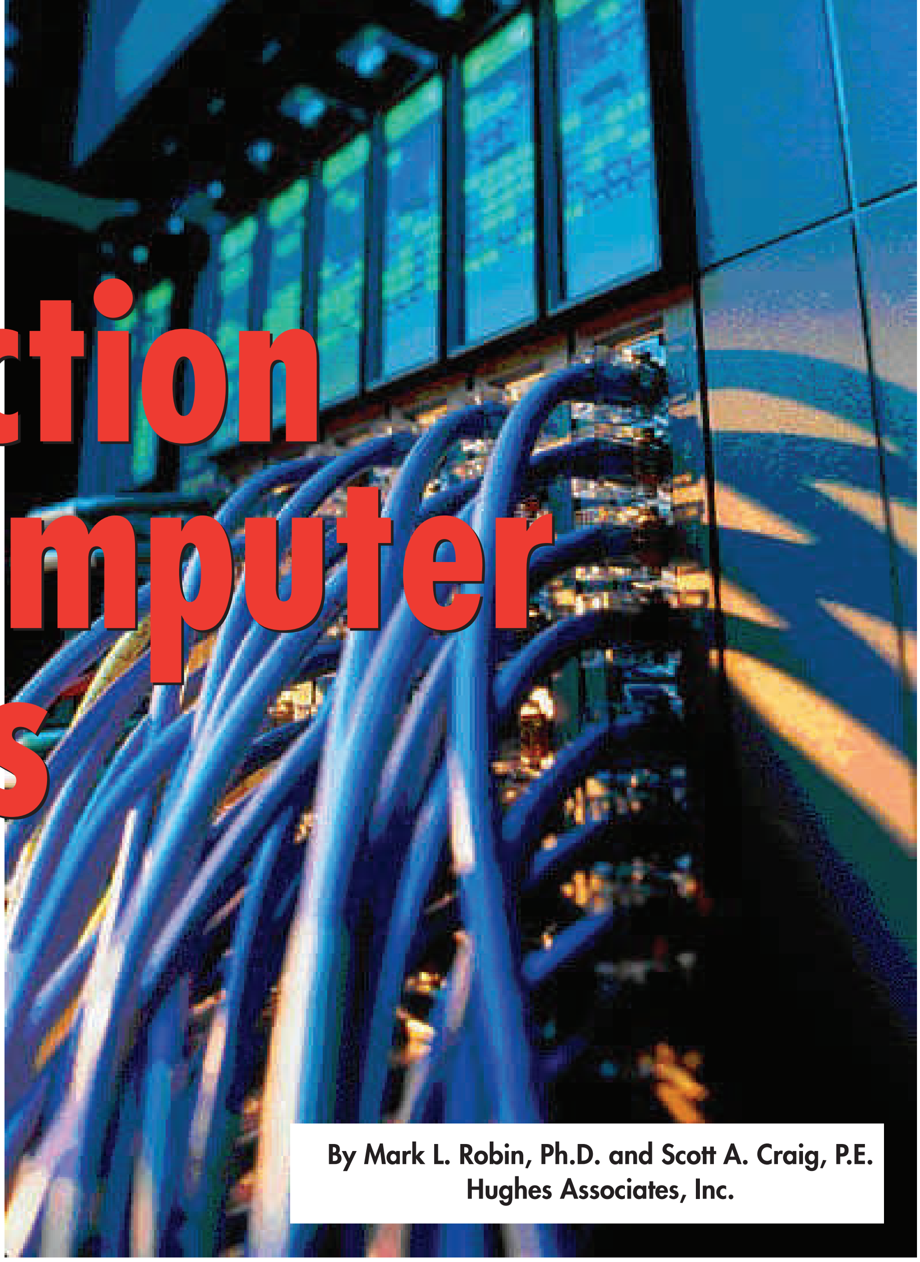
Fire Protection for Computer Rooms



By Mark L. Robin, Ph.D. and Scott A. Craig, P.E.
Hughes Associates, Inc.

Picture courtesy of Hughes Associates Inc.

AS DEPENDENCE ON COMPUTERS and other electronic equipment increases in both the business world and in households throughout the world, the importance of providing proper fire protection for these critical assets has increased. Numerous processes and systems are now controlled by computers, including semiconductor fabrication, petrochemical and steel-making processes, and local and global communication systems. The uninterrupted use of computers to control such processes is critical, as computer-related business interruptions can in many cases lead to the loss of millions of dollars in revenue in a relatively short time period.

Computers and electronic equipment are particularly susceptible to damage due to the heat, steam and combustion products (e.g., smoke, soot) which accompany a fire. Damage to certain electronic components can occur at temperatures as low as 39°C (100°F) with permanent damage resulting from exposure to temperatures in excess of approximately 49°C (120°F). Damage to magnetic tapes, flexible discs and similar media can begin at sustained ambient temperatures above 37.8°C (100°F), and sustained ambient temperatures of 66°C (150°F) can damage hard disks. Many electronic components begin to fail at approximately 79°C (174°F) with major component failures occurring for temperatures in the range of 149 to 200°C (300 to 500°F). Microfilm can suffer damage at temperatures of approximately 107°C (350°F) in the presence of steam, or at 260°C (500°F) in the absence of steam. Damage to paper products can begin at temperature of 177°C (350°F).

In addition to thermal damage, electronic components are susceptible to damage due to combustion products. A common combustion product of concern in computer facilities is hydrogen chloride, HCl. Gaseous HCl is produced when polyvinyl chloride (PVC) cable insulation is exposed to high temperatures. The HCl then rapidly reacts with the galvanized zinc encountered in most electronic circuitry and components to form a layer of zinc chloride ($ZnCl_2$) on the surface of the equipment. Zinc chloride is extremely hygroscopic, and picks up moisture from the surrounding air at as low as 10% relative humidity to form an extremely corrosive zinc chloride solution. Additional corrosive combustion products often encountered in computer room and data processing fires include hydrogen fluoride (HF), from the decomposition of fluoropolymers such as FEP (fluorinated ethylene-propylene), hydrogen bromide (HBr), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), acetic acid (CH_3COOH), and hydrogen cyanide (HCN), depending upon the exact composition of the organic materials undergoing pyrolysis.

Electronic components are also susceptible to damage from smoke, soot and corrosive particulates produced by a fire. For example, disk drives are susceptible to damage from particulates as small as 0.5 microns in diameter. Smoldering or slow growth fires, as are characteristic of computer room and data processing facilities, can produce non-conductive soots, These soots are large

particulates (>0.5 microns) and deposit out horizontally on equipment, forming an insulating layer on equipment, impacting contacts. In the case of more rapidly growing fires, the amount of organic volatiles produced from the fire is small due to efficient combustion, and conductive soots are formed, comprised of small particulates (<0.5 microns) which deposit on both vertical and horizontal surfaces. These conductive soots can lead to electrical shorting.

REDUCTION OF THE FIRE HAZARD IN COMPUTER ROOMS

As indicated above, the fuel load in a typical computer room consists primarily of electronic equipment and the electrical cables employed to supply power to the various electronic components. In order to provide a reduced fire hazard, current standards specify the construction of the electronic equipment itself, construction requirements for the building housing the computer room, and the materials and equipment permitted in areas containing computers and other information technology (IT) equipment. For example, in the United States, equipment and replacement parts for use in computer rooms must meet the requirements of *UL 478 Standard for Electronic Data Processing Units and Systems, UL 1950 Standard for Safety of Information Technology Equipment,* or *UL 60959 Standard for Safety of Information Technology Equipment.* With regard to materials allowed within a computer room, *NFPA 75, Standard for the Protection of Information Technology Equipment (2003 edition)* requires the following:

Picture courtesy of Hughes Associates Inc.

- Only computer and IT equipment and support equipment are permitted in the computer room
- Office furniture within the computer room must be of metal construction
- Only approved self-extinguishing trash receptacles are allowed
- Small offices and light hazard occupancies are allowed in the computer
- room only if noncombustible containers provided for combustible materials
- The amount of records within the computer room must be kept to the absolute minimum required for essential and efficient operation
- Rooms used for the storage of records are to be separated from the computer area by fire-resistive construction.

THE HALON ERA

In the not too distant past, computer facilities represented a major market for Halon 1301 and Halon 1211 extinguishing systems. The Halons are "clean" agents, leaving no corrosive or abrasive residues after their use, hence eliminating the secondary (non-fire) damage associated with extinguishing agents such as water, dry chemicals or foams. The Halons are non-conductors of

electricity, hence they are applicable for the protection of electrical and electronic equipment. Halon 1211, characterized by a lower vapor pressure, is more suitable as a streaming agent in portable extinguishers, whereas as the more volatile Halon 1301 is better suited as a total flooding suppression agent.

Due to their unique combination of chemical and physical properties, Halon 1301 and Halon 1211 served as a nearly ideal fire suppression agents for over 30 years. However, due to their implication in the destruction of stratospheric ozone, the Montreal Protocol of 1987 identified Halon 1301 and Halon 1211 as two of numerous compounds requiring limitations of use and production, and an amendment to the original Protocol resulted in the halting of Halon production on January 1, 1994.

In response to the production ban on Halons 1301 and 1211, the fire suppression industry has responded with a variety of Halon alternatives, and several of these have found use in the protection of modern computer facilities.

PORTABLE EXTINGUISHERS

In accordance with current standards, computer rooms should be equipped with portable fire extinguishers. In the United States, the requirements for the protection of information technology equipment are specified in *NFPA 75, Standard for the Protection of Technology Equipment.* NFPA 75 requires the provision of listed portable fire extinguishers of the carbon dioxide or halogenated agent type, maintained in accordance with *NFPA 10, Standard for Portable Fire Extinguishers.* Acceptable halogenated type agents for these applications include Halotron® 1 (American Pacific Corporation) and FE-36™ (Du Pont).

TOTAL FLOODING AGENTS

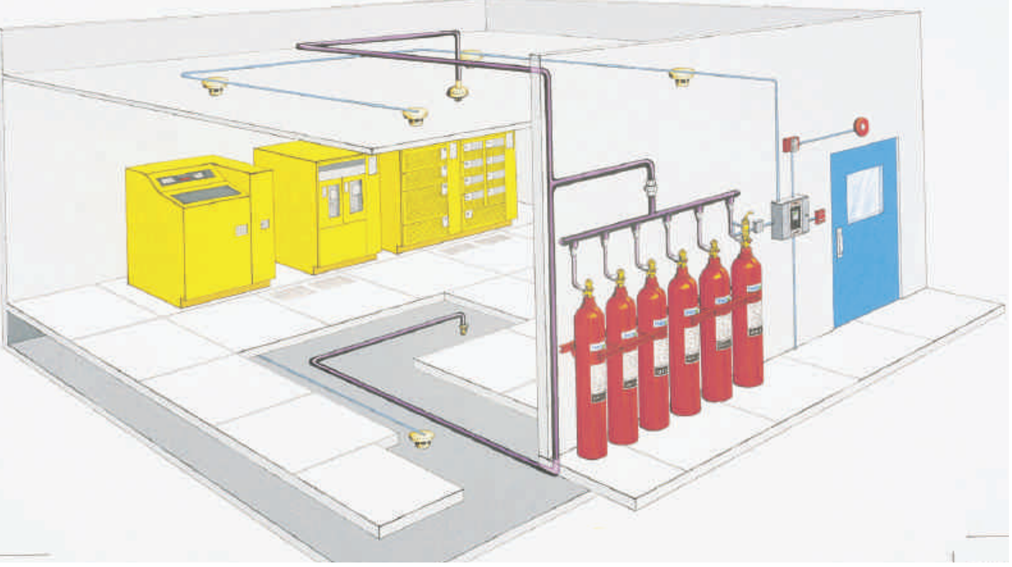
Given the high value and sensitivity of the electronic equipment involved, and the consequences of system interruptions, gaseous agent systems are often provided for the protection of computer rooms. The use of a gaseous total flooding agent is especially critical where there is the need to reduce equipment damage and to reduce or eliminate system downtime.

The primary objective of a gaseous clean agent system is to extinguish the fire quickly, limiting fire damage to the object(s) involved in the origin of the fire.

Hence, the purpose of a gaseous clean agent system is to protect the valuable and/or sensitive assets within the enclosure. Acceptable gaseous total flooding agents are described in *NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems (2000 edition).* The primary advantages of total flooding clean agents are as follows:

- Clean extinguishment – fires are extinguished without collateral damage due to agent discharge (no residues, no cleanup required)
- Rapid extinguishment during the early stages of fire growth
- Ability to extinguish shielded, obstructed or three-dimensional fires in complex geometries

These characteristics render the clean agents especially suitable for the protection of electronic equipment areas. The absence of residues and subsequent lack of cleanup allow for minimum service interruptions, and extinguishment in the early stages of the fire limits fire damage to the object(s) involved in the fire. The three dimensional nature of the clean agents allows them to extinguish hidden or obstructed fires within the protected area, for example a fire inside an equipment cabinet.



Computer Room Graphic Picture *courtesy of Hughes Associates Inc.*

A smoke detection system is typically utilized to actuate a gaseous agent system. In this case the fires are detected in their incipient stage, and hence the fire size at the time of system actuation for clean agent systems is much less than the fire size at the time of actuation for sprinkler systems.

Disadvantages of clean agents systems include high system cost and the requirement of an intact enclosure with doors closed and external ventilation secured prior to agent discharge.

Currently, in the U.S., the two most commonly employed total flooding clean agent systems for computer room applications are FM-200® (produced by Great Lakes Chemical Corporation) and Inergen™ (produced by Ansul) systems. FM-200® systems employ HFC-227ea (CF_3CHFCF_3) and extinguish fire primarily through the absorption of heat. Inergen™, a blend of nitrogen, argon and carbon dioxide, extinguishes fire by lowering the oxygen content to below the level required for combustion. Both agents are applicable for use in normally occupied areas.

Although not prohibited by NFPA 75, carbon dioxide systems are not a suitable choice for total flooding applications in computer rooms. This is due to the toxicity of carbon dioxide at the extinguishing concentrations required, and to possible equipment damage due to thermal-shock or due to the conductivity of carbon dioxide.

AUTOMATIC SPRINKLER SYSTEMS

In an effort to cut costs, computer rooms are in some instances protected by an automatic sprinkler system, primarily pre-action systems, in lieu of a gaseous total flooding system. The primary purpose of a sprinkler system, whether of the pre-action or wet pipe variety, is to contain the fire to the room of origin and to manage the temperatures at the ceiling to prevent structural damage and/or collapse.

It is important to note that the primary purpose of a sprinkler system differs significantly from the primary purpose of a gaseous clean agent system. The primary purpose of a sprinkler system is to *protect the structure,* and to confine the fire to its room of origin, whereas the primary purpose of a gaseous clean agent system is to *protect the valuable and/or sensitive assets* within the enclosure.

A preaction system, while less expensive than a gaseous clean agent system, provides protection of the building structure itself. A properly installed preaction system will help prevent loss of the entire building, but the degree of water damage to equipment in the data center can be extensive. In an effort to limit water damage, a time delay can be employed with a preaction system, delaying when the system is filled with water and giving staff time to evaluate the incident. Smoke detectors can also be cross zoned so that two detectors must alarm in order for the preaction system to be charged with water.

Sprinkler system activation occurs when the sprinkler head's fusible link or glass bulb reaches the head's rated temperature (approximately 135°F or higher). The attainment of such temperatures at the sprinkler head requires a relatively large fire, and as a result the damage to assets at the time of actuation of a sprinkler system will greatly exceed the damage at system actuation experienced with a gaseous extinguishing system.

For applications involving expensive, sensitive and critical equipment, substantial risk reduction at very high benefit/cost ratios may be realized by protecting these facilities with *both* a gaseous clean agent (to protect the assets), and an automatic sprinkler system (to protect the structure). Such a combination represents a logical and viable solution to the fire protection needs of such facilities.

WATER MIST SYSTEMS

Water mist systems have also been considered for the protection of computer rooms. The extinguishing action of water mist is due predominantly to dilution of oxygen in the zone of burning with steam resulting from the evaporation of water droplets in the heated area surrounding the fire. As a result, the ability of water mist systems to extinguish fires increases with the fire size – the extent of evaporation, and hence the degree of oxygen dilution at the fire, increases as the fire size increases. Water mist systems perform well in the extinguishment of large fires, hence their use in marine applications, for the protection of machinery spaces. A major advantage of water mist systems over conventional sprinkler systems is that the water mist systems employ less water than conventional systems.

Many installations have employed water mist systems for protection of the subfloor area of computer facilities.

CONCLUSION

As society's dependence on computers and electronic equipment increases, more attention must be given to the protection of such equipment and the facilities housing them from fire. Reducing the fire hazard within computer rooms and the employment of improved fire suppression systems are essential to protecting these critical assets.

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Scott A. Craig, P.E., has a fire protection degree from Oklahoma State University, is a licensed professional fire protection engineer, and has over 10 years of experience with special suppression systems include halon replacement analyses. He is employed with the Denver office of Hughes Associates, Inc. located in Broomfield, Colorado.

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Storage Tank Protection

Why Do We Need Fixed Foam Systems?

By Mike Willson

OIL-BASED PRODUCTS are increasingly being used as both a prime energy source and a basic feedstock for other petrochemical and pharmaceutical industries. This, coupled with the need to hold strategic stocks, means that very large quantities of these volatile products are stored in vertical bulk storage tanks. Tanks are found at numerous locations in the chain of distribution between the producing field, the refinery and petrochemical plants, loading jetties, distribution terminals, pipelines, downstream industries and the consumer products we all need, like heating, fuel for cars, plastics, paints, medicines and so on.

Fires in these tanks pose specific problems for both the professional fire fighter and the fire design engineer, which grow dramatically the longer the fires burn. Large quantities of flammable liquids are involved, which become increasingly difficult to control and extinguish the hotter they get.

Clouds of noxious smoke are given off into the atmosphere and toxic liquids may escape into water courses and rivers during an incident. It is vitally important to control and extinguish such fires quickly and efficiently to minimise their environmental impact.

Such swift action can also minimise the loss of these non-renewable energy resources, that help generate valuable foreign currency on international markets. Lets now look at how we should protect these valuable assets, to ensure we achieve effective fire protection and minimise the consequential losses in an incident.

FAST RESPONSE CRUCIAL

The most reliable means of ensuring that a fire fighting attack can be commenced immediately after a fire has been detected, is by ensuring that the fire protection equipment is already in position, which means having a fixed foam system permanently installed in the hazardous area.

This avoids answering lots of questions once the fire starts. Questions like:

- What are the required foam application rates?
- What are the water supply requirements?
- What fire pump capacities will be required and how can we achieve them?
- How much foam concentrate will be needed?
- What delivery equipment do we have to apply the foam – above the critical application rate?
- Can we get enough water pressure to project the foam onto the tank?
- Which way is the wind blowing?
- Are there sufficient fire hoses in good condition?
- What about cooling the other tanks?

WHY FIXED SYSTEMS?

There is **insufficient time** to start calculating the logistical requirements to extinguish the fire once it starts, and valuable time can be wasted in setting up large monitors and all the supply hoses to feed them. Whereas for fixed foam systems the equipment is already connected and these questions are all answered during the design phase before an incident occurs, so the system is ready to go at the press of a switch to take a pre-determined course of action to achieve the desired fast control and extinction. Fixed foam systems take all the "guesswork" out of fighting a tank fire, and normally use lower application rates than over the top monitor systems in recognition that all the foam is delivered onto the fuel surface where it can combat the fire.

In many ways fixed and semi-fixed systems are victims of their own success – regularly they operate and extinguish fires, while they are still small. There is no drama, no crisis, no adverse publicity because the foam system provides valuable cooling, seals the vapours, prevents

Angus Fire's HBPG Base injection system protecting hydrocarbon tanks

re-ignition and quickly extinguishes the fire while it is still small and remains a "minor incident".

- **before** it has had a chance to have a large environmental impact
- **before** it has drawn any media attention
- **before** it has caused extensive damage to on-line processes or surrounding plant
- **before** it has endangered personnel or incurred vast cost to bring under control.

A fixed foam system can be your best friend, for each day it helps to **minimise** the environmental impact of accidents involving flammable liquid storage around the world. Reducing the risk to site personnel as well as the general public, reducing any legal liability and reducing the potential for media interest are all hidden benefits of fixed foam systems. At the same time they are working to **minimise** the disruption to other plant processes on site, **minimise** the cost of repair, **minimise** the product losses and importantly **minimise** the impact on neighbouring plants.

To be able to provide efficient protection in this way, fixed foam systems require three things from the end user organisation:

1. Initial **commitment** to invest in the installation of a professionally designed and engineered fixed foam system, using high quality components for reliability and long life. Cost cutting here can lead to inferior equipment or system design that will give problems later.
2. Run **commissioning** trials once installed, to prove the correct action is being taken by the system. This is very important to satisfy senior officials and insurance companies that the system will work if needed.
3. Implementation of a system **maintenance** programme with full system testing – at least annually. Reliability, ease of inspection and low maintenance will be important decisions in selecting the specific types of equipment to be used in the system.

TANK TYPES

Storage tank protection accounts for approximately 70% of all fixed foam system installations.

There are three types of bulk storage tank for hydrocarbons and polar solvents commonly found in service. In terms of popularity these are:

(1) Fixed cone roof
(2) Open top floating roof
(3) Covered internal floating roof

We also need to consider their surrounding bunds/dike areas.

The selection of the most appropriate system will depend upon the construction of the tank and the fuel stored in that tank.

For fixed cone roof tanks containing hydrocarbons, both base injection and top pouring systems are normally acceptable. However if the tank contains any polar solvents or water miscible fuels then top pourers are the normal choice. Furthermore polar solvents demand the use of specialised multi-purpose or alcohol resistant (AR type) foam concentrates like Niagara AR-FFFP or Tridol AR-AFFF.

BASE INJECTION

The concept of base injection or sub surface foam injection only became feasible with the development of high quality fluoroprotein type foam concentrates like FP70, which have a high resistance to contamination by fuel and have good fluidity.Hence this is still the most popular, cost-effective and efficient foam for hydrocarbon tank protection. These fires are likely to be deep-seated and have been burning for longer than spill fires when the foam arrives. The finished foam must therefore have excellent burn back resistance and stability. Good FluoroProteins exhibit all of these characteristics.

In operation base injection systems introduce a very low expansion foam at a pre-determined application rate at the base of the tank through a High Back Pressure Generator (HBPG) above the water level. The foam then rises through the fuel to form an extinguishing blanket at the surface, dragging cold fuel up with it to disperse and cool the hot fuel zone at the surface. It is important that the HBPG is capable of working against the head pressure of product in the tank as well as pressure losses in the supply pipework. The most effective units have twin pressure gauges to easily check that the unit is working correctly and the back pressure does not exceed 40% of the foam solution inlet pressure. An integral non-return valve is also important to ensure there is sufficient energy to rupture the vacuum supported bursting disc as operation begins. Should line pressure fluctuate so that the unit stalls, the non-return valve prevents fuel from the tank spilling out of the generator air intake holes into the bunded area, which could cause a serious escalation of the fire.

Advantages of base injection system are:

- Rapid response with the optimum use of foam and water resources.
- The design application rate (minimum 4.1L/min/m^2) of foam solution is achieved.
- Because the system components are located at ground level normally outside the bund area, they are less likely to be damaged in the event of fire or explosion.
- Base injection systems are simple to retro-fit, operate and maintain.
- Valved take-offs from existing product lines may be suitable as foam inlets, provided the entry velocity of the finished foam does not exceed the design rates.This can avoid tank de-commissioning during installation.
- 40% back pressure capability allows downstream pipes between the generator and tank to be reduced, which can greatly reduce the overall system installation cost.
- Rotational currents caused by the rising foam stream carry cold fuel to the burning surface which can aid extinction by dissipating the hot zone. Tests have shown that surface temperature can quickly be reduced by up to 100°C by this circulation effect.

All these factors make for a more flexible and cost-effective use of available resources.

TOP POURING SYSTEMS

Top Pourer Sets or foam chambers deliver low expansion foam from above the fuel surface onto the tank shell to run down on to the surface, particularly important on polar solvent fuels. Suitable for use on fixed roof or covered floating roof tanks, top pouring systems are normally designed on the basis that the full surface represents the hazard area. Application rates recommended in international standards like NFPA11:2002, call for minimum application rates of 4.1L/min/m^2 for hydrocarbon fuels and 6.5L/min/m^2 or more depending on the polar solvent involved.

The system components are therefore sized accordingly and will comprise a suitable foam concentrate induction device, a combined foam generator, pourer and vapour sealing mechanism in a single robust, low maintenance integral unit. The vapour sealing glass disc

prevents flammable vapour escaping to atmosphere through the foam line, eliminating any consequent fire or explosion hazard.

Modern top pouring sets are factory calibrated to give the precise flow and pressure requirements of the system design. A new orifice plate can be provided to adjust flows to meet any pipework routing changes during installation for optimum flexibility. This allows the design engineer to make the most cost-effective use of the foam, water and pumping resources available on site.

Top pouring systems are also suitable for the protection of polar solvents or alcohols when used in conjunction with a suitable natural based alcohol-resistant foam concentrate such as Niagara for minimal environmental impact. An integral design of deflector is important as it simplifies installation and ensures the foam is dispersed against the tank shell to minimise turbulent mixing and reducing the application velocity. This ensures less fuel pick-up and a more rapid spread across the fuel surface. Equally important is the unit's ability to be tested without foam entering the storage tank, and without use of additional plates to block off the pourer which could then be forgotten and left inside after testing – which could disable the system in the event of fire!

Top pouring system advantages/disadvantage:

- Design application rates are achieved with all foam reaching the fuel surface.
- Robust and simple to operate.
- Can be tested in situ.
- Top pouring equipment may be susceptible to damage in the event of an explosion, when the roof intentionally blows off to prevent rupturing the tank.

Alternative systems using Large Capacity Monitors will be discussed in the next issue.

OPEN TOP FLOATING ROOF TANKS

These tanks have come into wide use all over the world because of the operational advantages they can offer over fixed roof tanks.They earn their keep by reducing costly evaporation losses and eliminating any vapour space above the fuel, hence reducing the fire risk.

For many years it was believed these tanks were so safe that fires were unlikely to occur. Many subsequent fires including Milford Haven in the UK have shown this is not necessarily the case and as a result a fire protection system to protect the rimseal became in many cases a necessity.

The main area of vulnerability to fire in these tanks is in the enclosed space at the seal between the floating roof itself and the tank shell. If the seal is damaged in any way, vapour will collect which can be ignited by lightning or sparks produced either by friction or static electricity.

CONVENTIONAL RIMSEAL POURERS

Rimseal pourers are fixed to the rim of the tank shell and should be designed to pour aspirated foam down the inside of

Effective design of Rimseal Foam Pourer crucial to minimise adverse effects of wind

the tank wall and into the seal area. To apply expanded foam effectively above the seal a foam dam must be fitted to the floating roof to prevent de-stabilisation from foam spreading across the roof. By containing the foam in this way sufficient depth should be achieved to flow laterally around the seal perimeter to the point where the seal may be damaged.

To take account of the much smaller surface area of the risk the foam generating equipment is sized accordingly. Fabricated pipe sections produce foam of poor quality that is frequently carried from the tank wall by the wind, so a specially designed unit with known foam properties should be used like the market leading yellow triangular Rimseal Pourer Sets.

An important consideration when selecting rimseal foam generating equipment is the ability to generate a coherent foam stream which will adhere to the tank shell and not be affected by wind – particularly important when the roof is low. The use of natural FP70 foam will assist this effect since it is more sticky than synthetic detergent based alternatives and will remain for longer as a protecting foam blanket in the seal area.

In addition quick and easy installation with a special fixing kit allows quick and easy retro-fitting without the need for hot work or tank decommissioning when riser pipes are already in place. The best units are factory calibrated to meet the specific flow and pressure conditions of the system design for a quick and easy upgrade of poorly performing or corroded units at minimal cost.

The other system widely used on such tanks during the 1970/80s was the BCF halon rimseal system. This was a fast acting technique to attack the fire early in its development, with sprinkler bulbs located in the rimseal area to detect a fire, connected to a central halon bottle for discharge. Early detection of most fires took place and a rapid short burst of halon was applied to the area. This proved to be effective on several occasions, however, the system did have numerous problems, including gas escaping the seal area, maintenance difficulties and the leakage of halon from the storage cylinders before they were required to operate.

Due to its ozone depleting effects such halon systems are considered unacceptable for such applications. Clearly it has now become a matter of urgency to remove these halon systems and find a suitable replacement.

OPTIONAL SELF-CONTAINED RIMSEAL SYSTEMS

New developments in foam equipment technology have provided a better Floatafoam solution to replace these halon systems and supplement conventional Rimseal Pourers. Detection tubing is ruptured by heat from a fire, the drop in pressure automatically triggers discharge of the water taking foam with it from a micro-inductor and delivering it through special aspirating nozzles onto the fire. Using this technique detection is very rapid (10–15 seconds) and as a result, extinction of the fire is also very fast – typically under 20 seconds for a fully involved seal fire. The use of pressure switches on both nitrogen supply and foam discharge lines provides a signal to the alarm panel, alerting fire fighters to any change in status of the system. This provides reliable, effective and efficient replacement for these halon systems.

In developing this better foam system, key considerations are:

Storage tank fires in Crude Oil tanks can lead to violent boil-overs if control is not established early

- Any self-contained foam system must be capable of extinguishing three types of fire, a small hole in the seal material, large tear where the seal area is exposed and a shoe gap fire. A fire may go undetected for many hours, especially when the roof is at a low level in the tank, so a reliable detection system is essential.
- In the unlikely event that a system fails to extinguish a fire, the aspirated foam blanket must be delivered gently and control burnback for more than 15 minutes.
- The small hazard area requires a high foam application rate to ensure the fire is contained before any escalation occurs.
- Foam concentrate should be stored in a separate reservoir and capable of providing the required levels of heat resistance and fluidity in the seal area could only be achieved by using Alcoseal.
- The system needs to be free of electrical components, using nitrogen gas filled linear heat detection tubing in 40metre segments to avoid any electrical contacts/ignition risks on the roof.

COVERED FLOATING ROOF TANKS

For covered floating roof tanks with light plastic or aluminium membranes, it is usual for the membrane to melt or sink in the event of a fire. Top pourer sets are again the preferred option, with the possibility of base injection dependent upon the floating roof construction. The danger with base injection on these tanks is that outlets can easily be blocked if the roof sinks or distorts. These tanks are generally viewed like Cone Roof Tanks above, for foam fire protection.

BUND/DIKE PROTECTION

In the past most fire fighting professionals have seen bund fires as being of secondary importance, but views are now changing. Evidence from recent major fire incident reports suggest this is a serious high risk area and should be protected. Many of these fires have either started or seriously escalated within the bunded area surrounding the bulk storage tanks themselves.

Some of the world's largest fires have become so large and "Infamous" simply because there was no adequate system of bund protection – and it keeps happening!

STANDARDS

Historically, the main foam system standard for the Oil industry NFPA 11 (National Fire Protection Association) in America provided no guidance on bund fires, offering only general guidelines for "supplementary protection" in storage tank bunded areas by using monitors and mobile AF120 foam units, which are very popular for spill fires in refineries and other industrial areas as it is so quick and easy to use. The latest revision NFPA 11:2002 now recommends low level foam discharge outlets (pourers) at 4.1Litres/min/m^2 over a 30 minute operating

period for Class 1 hydrocarbon bunded areas (20 mins for Class 11). The British Standard BS5306 Section 6.2:1989 was the first international standard to take bunded areas seriously as a hazardous area, and made specific recommendations of 4Litres/min/m^2 for 15 minutes using Medium Expansion (MEX) Pourer Systems.

The most common causes of serious bund incidents over the last 10 years have included leaking flanges, faulty valves, pump failures, electrical sparks, tank over-filling, blocked roof drains, pipeline ruptures, boilovers, lightening and of course spillage during maintenance work.

Incident escalation in the bund often forces firefighters to retreat rapidly, the fire may destroy or damage hoses and portable equipment, severely limiting the capability for further attacks. Forceful application of foam with monitors and handlines can spread the fire more quickly by splashing burning fuel into new areas, rapidly escalating the incident. All these factors also increase the risk to site personnel by reducing their personal safety.

BUNDS: THE WAY FORWARD

The latest advance in this area of protection has come from MEX Bund Pourers producing a free-flowing yet stable medium expansion foam blanket (typically 35-55:1) which acts swiftly to attack the fire by quickly producing large volumes of fluid yet bulky foam. Having a number of fixed MEX pouring outlets avoids the need for personnel to be close to, or inside, the bunded area and thereby increases the safety of firefighters at the incident.

These MEX bund pourers also employ a gentle application technique. The rapid production of a vapour sealing foam blanket gently floated across the fuel surface minimises any mixing with the fuel, avoids splashing and escalation and maximises protection against reignition – especially where FP or FFFP foam is used. MEX foam also buries and cools pipework, flanges and valves, minimising the risk of rupture or further distortion thereby reducing fuel leakage rates.

The free-flowing nature of the MEX foam gives fast knockdown, yet its cohesive nature is also very stable against wind, particularly when more sticky natural Fluoro-Protein based foams like FP70 are used.

A further benefit is the optimum MEX production at very low inlet pressures, typically 1.5–3 bar.g. Consequently pumping capacities are minimised and cost-effective simple fixed inline inductors can easily be used. The pressure drop through the inductor venturi (which can result in poor performance for low expansion monitor equipment) can be a positive benefit in MEX systems, as a way of losing excess pressure.

The effectiveness of MEX foam for bunds has been recognised in the British Standard with a reduced 15 minute operating time. Significant savings can therefore be made in terms of foam stockholding, pumping capacities and water storage when MEX is being used. Angus Fire's latest advance with their unique MEX bund pourers provides the most reliable and cost-effective solution to the bund protection problem.

CONCLUSIONS

Fixed Foam Systems take the "guesswork" out of fighting storage tank fires and can provide swift, efficient fire protection to control the fire whilst still small and avoid escalation. Considerable importance should be given to ensuring that the very best performance is obtained from your fixed systems in terms of reliability and low maintenance. A good foam will not perform at its best through poor quality equipment, neither will poor quality foam produce the best performance from excellent equipment! You get what you pay for at the end of the day!

It is also crucial to ensure that any foam system is regularly tested. It is adviseable to operate your foam systems and produce foam at least annually, to ensure they are in a state of readiness to help in your hour of need.

Automatic Fire Detection: *the Ever Present Sentinel*

By Terry Martiny
Marketing Manager, BFPSA and FETA

ARGUABLY THE BEST DETECTOR of fire is the human. Not only do we have a number of senses that enable us to identify the presence of a fire but we have the capability to assess the situation and take the appropriate action, whether it be to activate a call point, shout 'fire' or summon the fire brigade.

However, there are relatively few buildings where humans are present 24/7, and even in those where they are, the size and complexity of the building often means that the human presence needs to be supplemented by some form of automatic system. Furthermore, humans sometimes respond in an unpredictable way, perhaps not in the most appropriate way to deal with the threat.

The basic premise of an automatic fire detection (AFD) system is based very much on the human response outlined above i.e. firstly detect the fire, then process the information and finally generate an action.

FROM HUMBLE BEGINNINGS

The first automatic systems were fairly simple, with a heat detector (probably a bi-metal strip) linked to a control panel with an input which triggered a relay to generate a response from a ringing bell. Technology has moved fire protection a long way from these relatively humble 'electric' beginnings. Control units are now microprocessor based, with greater processing power than the computers that controlled the Apollo 11 moon landing. Response has moved on from bells and buckets of sand to cellular communications to an Alarm Receiving Centre (ARC), and audible alarms based on voice messages which remove some of the ambiguity and confusion created by the plethora of alarms now in existence. Automatic extinguishing systems are also a popular option. The banning of Halon, one of the most widely employed extinguishants in automatic extinguishing systems, has ensured that research into alternatives remains a significant area of development for the fire protection industry. Under European Directive EC 2037/2000, all owners of Halon systems and equipment are required to decommission by 31 December, 2003 – hence the focus on alternatives which can take their place.

CURRENT TECHNOLOGY

There are now a wide range of detection methods available, each employing its own technology to discriminate and, in some cases, assess the type and extent of the fire risk. The main technologies are:

Heat Sensors:

Either set to trigger at a preset temperature or measure the rate of rise of temperature. Theses detectors are simple and reliable but the fire could well have taken hold before the required activating temperature is reached.

Optical Smoke Detector:

A smoke detector normally incorporating an infra red light source and a receiver which is usually arranged to detect light scattered by smoke.

Ionisation Smoke Detector:

A smoke detector incorporating a small radioactive source, usually Americium, which ionises air within a sensing chamber causing a small current to flow. When smoke is present the current flow is reduced and this change is detected.

Automatic Fire Detection: *the Ever Present Sentinel*

High Sensitivity Smoke Detector:

A smoke detector with a much higher sensitivity than that specified for point smoke detectors (usually EN54-7) and normally incorporating special facilities for avoiding false alarms resulting from the high sensitivity. These detectors are normally associated with the protection of special risks or are incorporated into air sampling systems where any smoke would be diluted by clean air.

Multiple Sensors:

This type of detector employs two or more technologies to sense the presence of fire e.g. optical smoke and heat. They are particularly useful in environments that are prone to unwanted activation and can often be configured to perform in various ways.

Linear Heat Detector:

A heat detector, normally in the form of an electrically conducting cable or a fibre optic cable that responds to a change of temperature in the vicinity of the cable.

Detector technology is not standing still. There are ongoing developments in the above, as well as new approaches such as:

CO Fire Detectors:

This type of detector senses the presence of carbon monoxide using an electro-chemical cell. Unlike smoke, carbon monoxide is an invisible and odourless gas which cannot be detected by human beings. When present in the atmosphere in sufficient quantities, carbon monoxide can seriously impair the ability of people to react in a fire situation and can eventually lead to their death.

RISK ASSESSMENT

Which type of technology is employed is dictated by the nature of the threat and this is where 'risk assessment' comes in. In the UK the risk assessment route has effectively been in place since the introduction of the Fire Precautions (Workplace) Regulations and is very likely to remain the basic foundation on which the new Regulatory Reform Fire Safety Order is built. The new Order is expected to be brought into force in Summer 2004 and will apply to all places in England and Wales to which the public has access. This approach has brought concerns within the fire protection industry that a new breed of fire safety 'expert' has evolved, with no qualifications whatsoever, undertaking risk assessments and making major decisions about the safety of people and the protection of properties. This has led to some rather illogical decisions which brought John Worboys, Chairman of the Fire Extinguishing Trades Association (FETA) to comment at the association's 2003 AGM – "Some of the more perverse outcomes of those 'experts' has been to rule that elderly

persons' homes require no fire fighting equipment, and that huge comprehensive schools only require one fire extinguisher per floor. Let me tell you right now this is bunkum. It is the thinking of the naive and ill informed." There is also a strong feeling that many employers are woefully unaware of their responsibilities under the Workplace Regulations which brought Derek Harrington, Chairman of the British Fire Protection Systems Association (BFPSA) to call for a commitment from the UK government to a concerted and well funded publicity campaign to promote the new Fire Safety Order – "It is . . . imperative that the new fire safety regime is effectively publicised – unlike the Workplace Regulations that was introduced in 1997 like a damp squib – and that the right communications strategy is put in place."

REDUCING FALSE ALARMS

As automatic fire detection systems have increased as a means of protecting life and property from fire, so has the focus on the problem of 'unwanted' or 'false' alarms. The success of AFD's in saving life and limiting property damage is well documented but, despite improved standards, technological advances and improved reliability, one of the downsides to their increased use has been a continuing rise in the number of these false alarms. Organisations such as the BFPSA are trying very hard to address this issue and reduce the waste of fire brigade resources with initiatives such as the campaign to reduce false/unwanted fire alarms in which the association is working with the Chief and Assistant Chief Fire Officers Association (CACFOA) and the Office of the Deputy Prime Minister. Research has shown that an estimated 80 percent of the total false alarms which are classified by brigades as "due to apparatus" were attributable to less than 10 percent of systems. The main focus of this campaign has been to focus on these so called 'rogue' systems and the results of the campaign are proving encouraging.

OPPORTUNITY KNOCKS

The fire protection industry needs to continue to focus on reducing false alarms but this does not detract from the rise of automatic fire detection systems, in their various guises, as an essential weapon in the constant fight against fire. If the risk assessment based approach is to be successful, employers must be made very aware of their responsibilities in order that a building and its occupants have a fire detection system that is suited to the risk. The UK already has an enviable reputation as a leading exponent in fire detection technology: the new Fire Safety Order provides an ideal opportunity to take that expertise even further.

Terry Martiny

High-Rise Sec

By Rebecca Jew
Sako & Associates, Inc., Fairfax, VA USA

Picture courtesy of RJA/Sako & Associates, Inc.

WHEN ONE THINKS of high rise buildings, images of majestic skyscrapers silhouetting a cityscape comes to mind. Massive structures of metal, concrete, and glass combined forming works of art that are also functional. From a practical standpoint, architectural standards categorize a building as a high-rise when it is seventy-five feet above fire access level. Typically, this means an eight-story building. Although this does not conjure up glamorous images, the definition gives us a basic starting point to discuss the unique challenges of securing a high-rise building.

Historically, security has not been considered an ally to some building components. One example is life safety. In a rudimentary way, security and life safety are at opposing ends of the access spectrum. Security is meant to restrict access, and life safety needs open access, both for egress and emergency response ingress. Architectural aesthetics is another example. Architects have long been concerned that security equipment would detract from a building's visual appeal. Today, security has evolved into an integral part of a building. A well-planned security program is considered an enhancement to a building and a benefit to its tenants. There are four critical elements for developing a security strategy for a multi-tenant high rise building; planning, addressing key areas, incorporating inherent building features and response.

PLANNING

Just as developing an emergency action plan is part of the design process, developing a security plan is an integral part of the same process. There are many similarities between both disciplines. These similarities offer the opportunity for understanding the overall programming concept:

Objectives. Lowering the potential for loss in terms of people and property if an event occurs.

Programming. There are three basic parts of a security program. All three parts work together to form a cohesive program to achieve the overall objective.

1. **Policies and procedures**
2. **Equipment**
3. **People**

Define Vulnerabilities. Planning involves defining:

1. **What?** Define the assets to be protected
2. **Why?** Describe the reason(s) the assets are a risk
3. **How?** Describe the measures that will be used to accomplish the goals
4. **Where?** Define locations that the measures will be applied
5. **When?** Define potential operating hours for various security measures
6. **Who?** Define potential staffing requirements to maintain and operate the security equipment as well as providing the proper response.

The answers to these questions in the early stages of a building's design afford the maximum benefit at a lower cost, than if they are addressed at later stages. By designing security into the basic infrastructure of a building, the security program can work with the building, taking advantage of various design features inherent to the building. Oftentimes, when security is added as an afterthought, implementing it becomes like fitting a square peg in a round hole. A significant amount of effort is made to make it fit – and even then; it does not fit quite right.

A threat assessment may be performed even if the building has not yet been designed or constructed. A threat assessment involves identifying and factoring in key items such as adjacent businesses, local landmarks, and threats to specific tenant bases. It also identifies resources and threats in the community by gathering local statistics on issues such as crime, transportation availability, utility infrastructure, and emergency response. Apply the information in the threat assessment when designing comprehensive security program.

Preventive, Not Reactive. Lessons learned after the fact, while important, can be expensive in loss of life, property and pubic perception. Use security as a preventive tool, maintain and evaluate its effectiveness periodically. It is much easier to maintain an established, routine pattern of behavior than to introduce new practices as a result of an incident.

Defining Spatial Functions: In most multi tenant buildings, spaces can be defined as Public, Semi-Public and

urity Issues

Private. Defining the functions assists in defining the security applications for particular areas.

Most property management firms consider security within a tenant's private suite to be out of their scope, an issue for the individual tenant's concern. Their security focus is on the public and semi-public areas.

1 **Public:** Areas openly available to public access such as sidewalks, elevator vestibules and lobbies. If access to an area is not controlled, the area is considered public, such as an open garage or restrooms.

2 **Semi-public:** Areas that tenants and their visitors have access to, but are not necessarily accessible to the general public. They can also be shared tenant spaces such as a loading dock or controlled elevator vestibules and restrooms. An area can have both public and semi-public functions depending on the hours of operation.

3 **Private:** Typically, these are the tenants' suites or office spaces. Mechanical rooms and telephone rooms, which generally require a key to gain access, are also considered private.

Scalability: In multi tenant buildings, there is a potential for diversity in the tenant population. Additional factors contributing to potential losses range from business function to hours of operation to visitors and clients. Even if a building has defined field for their tenant base such as "Financial Services" or "Legal Offices", an infinite number of specialties could be located within the suites of the building. Threats to such a wide range of tenants vary greatly – security scalability is crucial.

KEY AREAS

Lobbies. Design elements in the main public lobby offer opportunities for security that are both flexible and scaleable. Properly planned lobbies provide options for various security configurations that are adaptable as threat levels change and as the tenant base changes. Design the lobby large enough to create a screening area. The screening area may not be used initially, but having adequate space will allow future implementation, if needed. Ideally, a screening area would guide tenants and visitors to separate entrances. This would allow the tenants easier access and a smother flow of pedestrian traffic. Allow enough room for equipment to screen both people and packages. Adequate signage providing direction and instruction is key. Provide power and data lines, these can be disabled and then activated for future use.

Equipment such as optical turnstiles and camera systems are excellent tools for lobby control. Optical turnstiles provide screening while allowing a maximum flow of pedestrian traffic. Camera systems extend the view of guard services, while recorded images provide back up data if an event occurs.

Loading Dock. The loading dock area is especially susceptible to potential security threats. While the space is semi-public, most loading docks are located in remote areas of the building, away from the general population. Many vendors and delivery services require access to the area and, usually, it is not economically feasible to staff it during all business hours. Also, it is usually not possible to identify the contents in packages and the packages are not screened. Ideally, locate the loading dock in an area where it can be observed from a staffed location such as the building management office. Loading docks can be located near a designated smoking area, giving it the feeling of being observed. Similar to lobbies, allow adequate space for equipment to screen packages, if needed.

If possible, keep the loading dock locked at all times. An intercom can provide communications for persons requesting entrance. Building staff would respond to the request and open the dock. Use signage limiting delivery hours to restrict staff's need to be on call. If the building elects to use a remote release function, provide a camera and monitor to identify the person requesting entrance, or use an intercom with an integrated camera.

Developing policies and procedures regarding specific routines at the loading dock allow more control. Including a compliance form to the policies and procedures in the lease agreement promotes cooperation from the tenants.

Mechanical Systems. Modern high-rise buildings are smart buildings. It is understood that although there are many individual systems supporting the building functions, they all work together creating a healthy, safe, energy efficient, environment for the tenants. Security for these systems can enhance their operations by "Lowering the potential for loss in terms of people and property if an event occurs". Current security industry practices recommend that the location of the intakes of HVAC systems be mounted in a location that is less accessible to persons attempting to introduce a chemical or biological weapon into the building. Minimally, the intakes should be mounted about 10 feet above the ground, and ideally they would be above the third floor level.

Picture courtesy of RJA/Sako & Associates, Inc.

Picture courtesy of RJA/Sako & Associates, Inc.

Picture courtesy of RJA/Sako & Associates, Inc.

High-Rise Security Issues

Parking Garages. Ideally, to minimize or avoid the impact of an explosive being delivered by an unscreened vehicle, locate the parking area outside of the footprint of the building. If space limitations only allow for a parking garage under the building, limit the vehicles allowed to park under the structure to known people and tenants only. Designate separate areas for visitor parking and tenant parking. Use card access to allow tenants to enter the parking garage and CCTV surveillance of the entry and exit to record the vehicles entering and leaving. If it is necessary to allow visitors to park in an underground parking, staff the parking garage with an attendant to provide additional surveillance while assisting tenants and visitors with parking needs. Direct oversize vehicles and visitors to another designated area.

Vertical Transportation. Elevators and stairwells provide inter floor transportation. During regular business hours, elevators and stairwells are usually considered public. They are open and unlocked allowing for unimpeded travel between floors. Unlocked and open stairwells provide an easy escape or a hiding place for criminals. Ideally, access to floors during non business hours should be restricted. If possible, provide separate stairwells for emergency egress and inner floor transportation.

SOFTER SIDE OF SECURITY

Several years ago, a major retail chain known for their appliances and hardware, launched an advertising campaign about their "Softer Side". It highlighted other merchandise not commonly associated with the chain's image. In the past, security has earned an image as a hardened, sometimes oppressive, entity often conflicting with a building's architectural integrity and day-to-day functions.

Crime Prevention Through Environmental Design (CPTED) is based on the idea that the proper design and effective use of the built environment can lead to a reduction in the incidence and fear of crime, and an improvement in the quality of life. In other words, if a site is laid out well, the likelihood of it being targeted for a crime may be reduced.

Crime Prevention is defined as the anticipation, recognition and appraisal of a crime risk and the initiation of some action to remove or reduce it. CPTED takes crime prevention one step further by studying the site design and working with the development community and public development agencies in an attempt to create safer designs in new and existing developments.

CPTED is comprised of four basic guidelines:

1 **Natural Access Control:** Uses architectural elements to clearly define public, semi-public and private spaces. Other key elements such are used such as lighting, landscaping, paving, and/or signage to guide vehicular and pedestrian traffic to specific entrances. Limiting the number of entrances reduce the number of public access points which are watched by guards, receptionists, nearby tenants, or passing traffic.

2 **Natural Surveillance:** Allows clear lines of sight to minimize blind spots and enhance observation. The primary

focus is directed towards providing easy observation of intruders. The use of interior and exterior lighting and proper landscape maintenance improves the effectiveness of natural surveillance. Keep shrubbery under three feet in height for visibility. Prune the lower branches of trees to at least seven feet off the ground. Do not obstruct views from windows.

3 **Territorial Reinforcement:** Maintaining a clear definition of public, semi-public and private spaces help develop a sense of territorial control and discourage potential offenders. Define perimeters with landscaping such as berms or fencing. While beneficial in defining borders, the perimeter fences should not hinder natural surveillance. Their design should be open and maintain visibility from the street. Using a reception or information desk will define the transition into more controlled areas. Signage also reinforces the spatial identity.

4 **Target Hardening:** Uses architectural features to prohibit entry or access. Good quality door hardware, locks, deadbolts and window film are elements of target hardening. Install door hinges on the inside of the door, or use tamper-proof hinges. Routine maintenance and timely replacement of damaged hardware minimize weaknesses in an otherwise good design.

RESPONSE

In the event that an incident occurs, written procedures provide the framework for proper response. Procedures range for daily duties to post orders outlining specific steps and responsibilities for a given incident. Document and clarify the what, why, how, where, when and who, as discovered during the planning stage. For each situation, include an incident response procedure, a process in which to document the incident, a chain of command, and instructions defining actions if an incident escalates. Provide the tools, communications and personnel to implement the response. There are several options for providing response personnel. Some of the more typical methods are:

Alarm Monitoring Service. An off-site third party alarm monitoring service monitors alarm. If possible; select a service provider that also monitors the building's life safety system. Monitoring service can be provided on a 24-hour/ 7 day schedule or just during non business hours. Typically, the monitoring service contract is renewed on an annual basis.

Contract Guard Service or Proprietary Guard Service. Guard posts can be established for key locations at a building. Guards can either be from a contract guard service or employed directly by the building management. If additional duties are to be performed, clearly define them and their priority. Additional duties may include:

- **Patrols:** Patrolling the parking lot, and/or building
- **Receiving:** Responding to access requests for the loading dock
- **Visitor Sign in:** Checking in visitors in the main lobby
- **Escort:** Providing escort service to the parking area for tenants during hours of darkness
- **Screening:** Screening packages and visitors
- **Rover:** Physically responding to incidents

Local Law Enforcement. In some jurisdictions, local law enforcement agencies are available to respond to incidents. False alarms may incur a fine.

CONCLUSION

Measuring the success of a security program is difficult. Common sense says that if zero incidents occur, then the program must be successful. Don't accept the incorrect conclusion, that when nothing happens, a program can be considered unnecessary. Admittedly it is difficult to measure, nevertheless prevention is the key objective.

While securing a high rise building has many challenges, it is often a necessity in today's world. Incorporating a comprehensive security program by careful planning and preparation is an ideal means for a building manager to take advantage of a security system's ability to improve the services a building has to offer. Using other building systems such as lighting and landscaping; a healthy, safe, energy efficient, environment for the tenants can be created. Prompt, reliable and proper response is a necessary part of the security program. Security has become an integral part of a building, enhancing its functions, features, marketability and overall quality of life.

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Design and Installat for Water Based Su

By Jim Beals, P.E., Operations Manager, Fire Protection Management, Inc. Fairfax, VA USA

CONSIDER THAT YOU are a design professional and for one reason or another you have decided to install a fire protection sprinkler system in your latest project. The factors that have gone into your decision to put up with the horrors of having to install one more mechanical system into your already congested project are many.

The most common is of course that the model building code in effect for your project mandates the installation of the fire protection sprinkler system. After all, except for some high end single family home builders which offer residential sprinkler systems as an option, usually the decision to install these suppression systems has been taken out of your hands and mandated by the building code. This is usually as a result of the type of building you would like to build, or its height or occupancy, or due to any number of construction variables and combinations.

The point is that you must install fire protection sprinklers throughout your project. This article is to briefly discuss some of the pitfalls and misconceptions that I have seen in my professional career.

Let me point out that I started out in the fire protection profession working in the sprinkler system contracting branch of the field. I was lucky enough (not that I thought so the time) to work for an employer who believed that his newly hired, fresh out of school engineer and project manager should spend enough quality time in the fabrication shop and in the field to better understand the problems associated with getting a system installed and operational no matter how good or bad the sales and design department did their job. I came to learn the things to look for in solicitation documents that would present themselves later as opportunities to request and justify change orders. For example, I learned the most efficient way to space sprinklers in a speculative office building, while complying with the letter of the contractual design requirements, so that there would be more sprinkler heads to add or relocate during the tenant development phase. I was doing my job, and causing sprinkler systems to be installed to protect life and property to the best of my abilities. I was also doing the best I could to make money for my employers.

Through one method or another, design and construction documents detailing the system requirements have to be created and incorporated into the solicitation package.

I have since joined the world of consulting engineering. I am on the "other side of the table" now and try to use my experience to prevent the vagaries of design and miscommunication which lead to change orders and additional expense.

For our hypothetical project, I must assume that you have taken advantage of all of the building code trade offs available to you in a fully sprinklered building. It is a long list and I am sure that you have considered them all. Let us now look at the most common path of getting from the initial requirement to install sprinklers to the final fully functional fire protection sprinkler system.

Through one method or another, design and construction documents detailing the system requirements have to be created and incorporated into the solicitation package. The design professional is serving at least two masters however. He or she is working to create a design package which will meet or exceed the legal requirements of the building code and which will usually result in a permit for construction. In other words, he or she is trying to put enough information on the design documents to make the building official happy.

He or she is also trying to create a document that clearly defines the desires of the client while staying within the scope of work for the project, and at the same time clearly and accurately providing the appropriate information to the contractors who will be bidding on the project. The result may just be a performance based specification requiring compliance with the appropriate design standards. Or it may be a complete design drawing and specification package which shows everything with a high level of detail and clarity.

There are dangers to the design professional no matter what level of detail is finally provided. Only require "compliance with the Building Code and the requirements of NFPA 13 (National Fire Protection Association Standard for the Installation of Sprinkler Systems)" and the contractor will have a field day

ion Considerations
ppression Systems

showing you just how much leeway that gives him to put in the most profitable system he can. Go all the way to the other end of the spectrum and create a highly detailed drawing and specification package and learn how getting exactly what you asked for may not be a good thing.

Usually the highly detailed design packages create a situation where the design professional intends to say one thing and the contractor actually hears, and sells you another.

For example, have you ever seen a design package that requires the installation of semi-recessed sprinklers in one area and fully recessed sprinklers in another? This usually becomes a major money maker for the contractor. Doesn't seem like it though, does it?

Let me give you a clue here by letting you know a big secret in the sprinkler contracting world. Write this down, it will save you money: There is no such thing as a semi-recessed sprinkler head. For some reason, design professionals, both engineers and architects, have come to use the term "fully recessed" when they want the concealed style of sprinkler head with a circular cover plate. They use "semi-recessed" when they want the sprinkler head to be exposed but partially recessed into the ceiling. The terms they should actually use are "concealed" and "recessed" sprinklers respectively.

When a contractor sees the requirement for semi-recessed sprinkler heads in certain areas and fully recessed in others, he usually knows what was really intended. But do you actually get that? No. What you get is recessed sprinklers everywhere, in compliance with the contract documents because there is no such thing as a semi-recessed sprinkler head, and a hefty change order to install concealed heads where you want them. This is not as expensive when you catch it prior to installation, but it will still cost you some extra money.

I have also seen design documents which were intended to require the installation of sway or earthquake bracing independent of the probability of actually suffering earthquake damage. The design professional, with all good

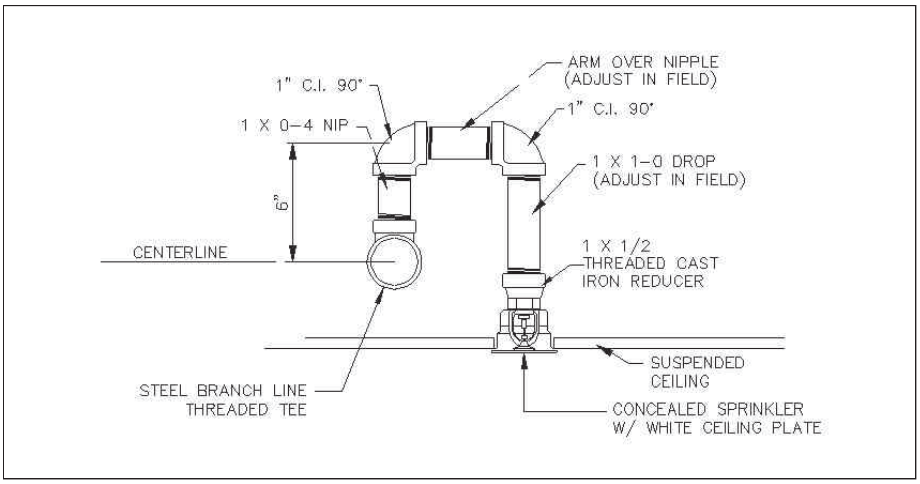
In order for a contractor to design and install his sprinkler system piping to be able to locate the sprinkler in the center of tile is rather complex.

intentions, requires "earthquake bracing in accordance with NFPA 13". Think about it, unless the project is in an area with a moderate to high probability of earthquakes, does this statement actually require earthquake bracing? The answer is no. The best way to actually require earthquake bracing in this case is to state "Earthquake bracing shall be provided. Design of earthquake bracing (components, location and installation) shall be in accordance with NFPA 13". There is a big difference between these two qualifications.

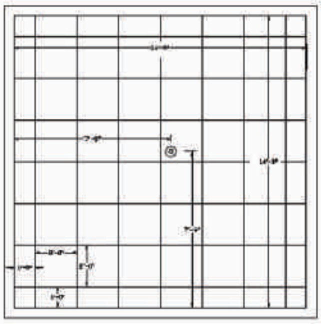
Another example of getting what you asked for and having it cost you is the oft used requirement for locating the sprinkler heads in the "center of tile". Most design professionals do not realize that this little requirement will significantly add to the final cost of the sprinkler system. In this case, "significantly" means increasing the cost of the sprinkler system by 30%-40% or more.

It is very attractive to an architect to tell his client that "fully recessed sprinklers will be used in all areas with finished ceilings, and they will be located in the center of acoustical ceiling tiles" We've already discussed that he should be asking for concealed sprinklers, but what about the center of tile issue?

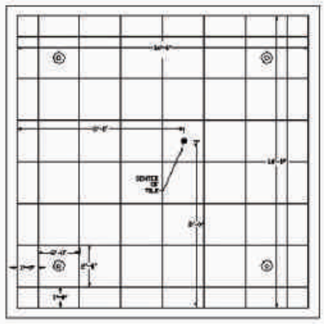
In order for a contractor to design and install his sprinkler system piping to be able to locate the sprinkler in the center of tile is rather complex. First, the design and installation must take great pains to locate the sprinkler branch line piping so as to actually miss the center line axis of the acoustical ceiling tile by at least six inches. Take into consideration that the sprinkler system piping will probably be installed a long time prior to the installation of the ceiling grid. He will be utilizing the reflected ceiling plans for coordination. If all goes as



Method for centering heads in tile



14ft square room with one sprinkler head not centre of tile



14ft square room with four sprinkler heads in centre of tile

planned, this gives him enough room to be able to install a swing joint (commonly referred to as a "goose neck") consisting of at least two 90-degree elbows and pipe nipples cut to the exact length required to put the sprinkler in the center of the tile.

Therefore, he is using much more material and labor as compared to simply roughing in the sprinkler piping so as to miss the ceiling grids and fixtures. And don't forget that it will end up being a more highly skilled sprinkler fitter doing the final sprinkler installation with the labor rates adjusted accordingly.

Also, requiring center of tile sprinkler installation tends to increase the physical quantity of sprinklers required to protect a given space. For example, take an office with inside wall to inside wall dimensions of 14-feet in both directions. The ceiling consists of 2-foot by 2-foot acoustical ceiling tiles with a 1-foot wide border along all four walls. Using standard coverage sprinklers, which allow spacing up to 7-feet 6-inches off of any wall, a single sprinkler can be located near the center of the room and not come within 6-inches of the ceiling grid while providing adequate sprinkler coverage.

Take that same configuration however and require that sprinklers in tile ceilings be located in the center of tile. Four sprinklers would now be required as he can't locate a sprinkler near the center of the room while staying in the center of tile without exceeding 7-feet 6-inches off of at least two of the walls. See the illustration below.

More sprinklers means higher flow rates in the hydraulic calculations used to size the pipe. Higher flow rates means larger pipe and material and installation costs. So please don't arbitrarily automatically require center of tile. Granted that there are times where this requirement is justified based upon aesthetics and other issues just understand that you must accept higher final costs.

Pipe and fitting materials selection is one area that is usually safe to give some discretion to the contractor. The requirements of NFPA 13 with respect to selection and utilization of pipe and fittings are very thorough. The materials all must comply with various national fabrication and testing standards which have been qualified over the years. In certain instances a design professional or his client will require, or conversely prohibit, a particular piping material or style of fitting. Some materials are much more expensive than others, galvanized pipe for example. Accordingly, the design professional must know the financial impact of the effect of his material specifications.

Usually the document package will require that black steel pipe will be required in either a schedule 10 (thin-wall) or schedule 40 (standard wall) thickness. Fittings are usually screwed cast iron or mechanical grooved styles. This is all considered to be industry standard. Copper pipe with brazed or soldered fittings are sometimes specified or utilized as well as CPVC plastic pipe. The design professional should determine if he the project has any special needs which will require asking any particular material.

Other than the previous discourse on sprinkler head styles, there are several additional issues to be aware of with respect to sprinkler head selection. NFPA 13 goes to great lengths to define the spacing criteria for standard coverage sprinkler heads. Within the past 5 years or so the sprinkler manufacturing industry has developed more and more special application and extended coverage sprinklers. NFPA 13 recognizes this by allowing the use of non-standard sprinklers as long as they are installed in accordance with their listing by an approved testing agency.

As an example, there are sprinkler heads now on the market, listed and approved for use in automatic fire protection sprinkler systems, which allow for sprinkler spacing up to 20-feet on center in both directions. This is a huge increase compared to standard coverage maximum allowable spacing of 15-feet on center in both directions in a light hazard application. Visualize an 18-foot square room. Four sprinklers would be required if of the standard coverage style. Adequate coverage for the same room can be provided with one extended coverage sprinkler head.

As a rule of thumb, in light hazard occupancies (normal business occupancies for example), the fewer the quantity of sprinklers the lower the overall cost.

These are just a few of the areas in which I have seen the creation of gray areas in design and construction documents which have led to confusion and waste. Creating a tight and comprehensive design document is almost always the best way of getting a good job installed within budget. The design professional must become knowledgeable in the correct terminology and techniques of fire protection sprinkler systems and the client must understand that sometimes it takes a little more money upfront to save a lot of money in the end.

There are sprinkler heads now on the market, listed and approved for use in automatic fire protection sprinkler systems, which allow for sprinkler spacing up to 20-feet on center in both directions.

Mr. Jim Beals is Operations Manager for the Washington, DC area office of Fire Protection Management, Inc. (FPM). With over twenty years of fire protection experience, Mr. Beals has designed and managed the installation, inspection and testing of fire suppression systems for all types of occupancies. FPM is a subsidiary of The RJA Group, *global fire & security consultants*, and provides construction management services for clients fire protection and life safety systems. To learn more about FPM visit their website at www.fireprotectionmanagement.com.

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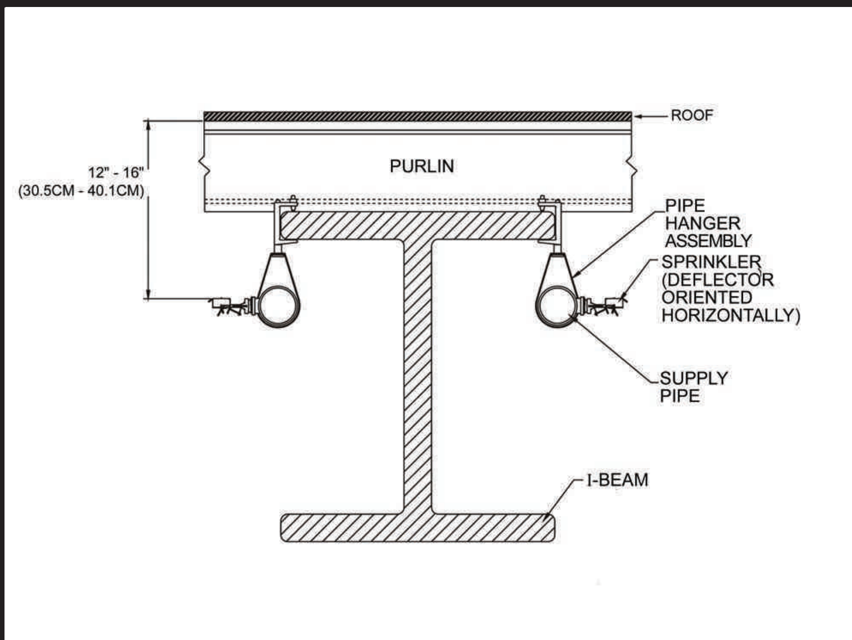

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AN APOLOGY

Within Issue 14 May edition of *IFP*, we inadvertently printed the wrong photograph with the **Vision Fire & Security** press release on page 78. We would like to take this opportunity to apologise to Vision Fire & Security for any inconvenience this matter caused. We are happy to be able to reprint the information below with the correct image.

VESDA has become synonymous with high-performance aspirating smoke detection, while Vision Fire & Security – manufacturer of VESDA – is established as a market leader for its expertise in very early smoke detection.

There are now numerous products within the VESDA portfolio, all of which are designed to provide active detection in a wide range of environments. Newest to the range is VESDA Exd, specifically designed for hazardous areas.

Vision Fire & Security is a member of the Vision Systems Group, which was launched in Australia in 1984 and now has annual growth rates exceeding 35 per cent.

For more information please contact:
Zsuzsanna Csuthi/Samantha Verrall
Vision Fire & Security, Vision House,
Focus 31, Mark Road, Hemel Hempstead,
Hertfordshire HP2 3BW
Tel: +44(0)1442 242 330
Fax: +44(0)1442 249 327
Website: www.vesda.com

SOPHISTICATED FLOATING ROOF TANK PROTECTION

Floating roof storage tanks have come into wide use all over the world in the past 4 decades for storage of crude oil and refined hydrocarbon products.

The construction of these tanks has improved during the years as well as the construction of the seals between the floating roof and the tank wall.

The application of primary and secondary seals is a common thing nowadays as these double seals reduce evaporation losses dramatically, however many conventional seals are still in use.

The manner of dealing with fire detection and protection of floating roof tanks is a challenging job because of the different seal designs, single or double, with or without weather shield, all in different shapes and sizes.

The modern seal designs are very sophisticated and require a different approach compared to the "old" ones, specially with regard to the type of damage that can be expected in case of a failure of a seal due to unforeseen mechanical impact or due to a direct hit by a lightning strike.

This means that the traditional ways of fire fighting are not always efficient for the achievement of a rapid extinguishment.

While fires around the well known old primary seal constructions were mainly located at low level above or lower than the top of the floating roof pontoon, the area of a fire on a modern seal is at a much higher level; often around the top of the secondary seal.

Although low expansion foam is very secure for the extinguishment of a rim seal fire, it takes a lot of time and a lot of foam after start of the release of the foam in order to fill the area between the foam dam and the tank wall up to the level of the top of the secondary seal.

For this reason it is obvious that the application of a three dimensional acting fire extinguishing agent, applied to a fire within a short time after the start of the fire, is a very efficient way of fire fighting. There is no chance of reignition because the time between the start of the fire and the extinguishment is too short for heating up materials above the flash point of the stored hydrocarbon.

The use of a gaseous fire extinguishing agent is not new; many floating roof tanks have been equipped with the self-contained Halon 1211 fire protection system in the past 35 years.

This Halon 1211 system has proven its efficiency during the years by many successful extinguishments of rim seal fires. Due to the fire fighting principle of "anticatalytic" reaction of the Halon in the flame area, a fire was rapidly extinguished. The combination of a gaseous streaming agent with a high specific weight and a proper distribution in the relative fire area gave a high degree of reliability even under severe meteorological conditions.

Halon 1211 however is an ozone depleting substance and is banned as a result of the Montreal Protocol. This means that this excellent chemical extinguishing agent is no longer available.

Mainly all the known Halon alternative agents are not suitable for this specific application. The majority of these alternatives is developed for total flooding applications (room protection) and only a few are applied as a streaming agent.

Since a couple of years a particular chemical agent iodofluoromethane (CF3I) is commercially available as a streaming agent. This agent is very promising in the aircraft industry as a fire extinguishing agent for engine nacelles. Contrary to the other streaming agents this CF3I is the only agent acting in the same way as the Halon 1211 with the "anticatalytic" fire fighting principle and a similar high density gaseous phase. This agent is environmentally friendly and listed by the U.S.A. Environmental Protection Agency. The Ozone Depletion Potential is <0.008 and the Global Warming Potential is <5 with an atmospheric lifetime of < 1 day.

This CF3I is an excellent agent for this floating roof tank protection system and is even better than the Halon 1211 as indicated by the independent laboratory cup burner tests and actual tests on rim seal test dummies.

Because of its higher efficiency and improved distribution of the agent in the anticipated fire area this CFI floating roof tank protection system is even more "state of the art" compared to the Halon 1211 floating roof tank protection system.

This CFI system will be custom designed and can be attuned to all known rim seal designs available in the world.

This new CFI fire protection system is a valuable replacement for the existing Halon 1211 floating roof tank protection systems and offers the best solution for the protection of new tanks and tanks which are not yet equipped with a fixed fire extinguishing system.

For more information please contact:
Saval B.V.
Tel: +31 76 5487000

SMOKE DETECTOR BRINGS ALARM CONTROL WITHIN EASY REACH

FFE has launched a new version of its single-unit beam smoke detector, Fireray Reflective, which makes routine testing simpler and faster. An optional low-level controller allows authorised personnel to carry out alarm tests from a convenient location, without the lengthy and potentially expensive process of accessing detectors installed at height.

Correct alarm function can be checked using a simple key switch on the controller. Also featured is a serial port which allows the detector's output signal to be checked using a laptop computer. Long-term diagnostic checking is possible if a datalogger is used.

Designed to protect buildings with high ceilings and open spaces, Fireray Reflective combines an infrared transmitter and receiver in a single unit. An infrared beam is projected onto a small, high-precision prismatic reflector mounted on the opposite wall. The reflector returns the beam to the transmitter/receiver unit, where the signal is analysed for smoke presence. In suitable buildings, this "all-in-one" design can achieve significant cable savings over detectors which use separate transmitters and receivers.

Two versions of the detector are available to cover distances up to 50 m and 100 m. Correct installation is ensured by a simple alignment aid: coloured flashing LEDs indicate when the detector is precisely aligned with the reflector for optimum signal strength.

Automatic drift compensation prevents unwanted alarms caused by a gradual build-up of dust on the detector, or movement of the building. Supply voltages of 12 V DC to 24 V DC can be used, and current consumption is very low – only 4 mA at 24 V in the quiescent state.

For more information please contact:
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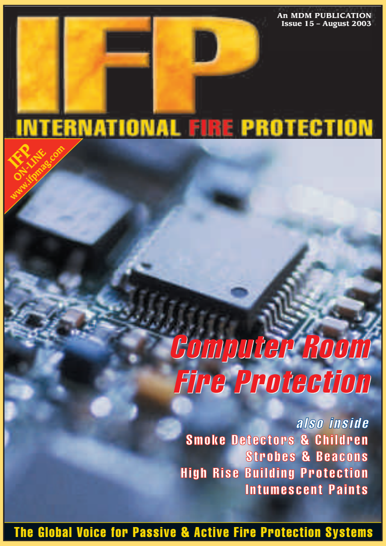

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Issue 16 – November 2003

IFP

INTERNATIONAL FIRE PROTECTION

The Global Voice for Passive & Active Fire Protection Systems

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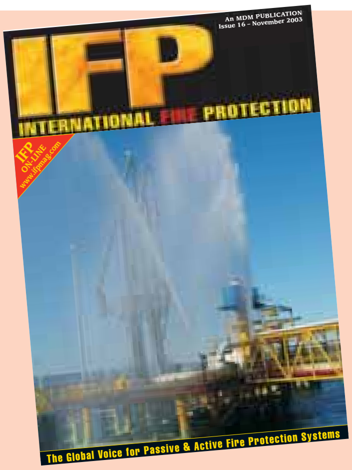

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Fixed Foam Systems

By Mike Willson of Angus Fire

Angus RCMe-80 Electric Remote Control Monitors with EExd flameproof motors for Zone 1 hazardous area protection on a loading jetty in South America.

HIGH RISK OIL RELATED INDUSTRIES have complex hazards which need adequate fire protection. This is increasingly being achieved by the installation of Fixed Foam Protection Systems that **minimise**:

- risk to life
- business interuption
- damage to high value assets
- risk of escalation
- adverse publicity
- environmental pollution

HAZARD COMPLEXITY INCREASES

Oil-based products are increasingly being used as both a prime energy source and a basic feedstock for other petrochemical and pharmaceutical industries. This, coupled with the need to hold strategic stocks, means that large quantities of these volatile products are stored at numerous locations in the distribution chain between the production field, the refinery and petrochemical plants, loading jetties, distribution terminals, pipelines, downstream industries and the consumer products we all need, like heating, fuel for cars, plastics, paints, medicines and so on.

Apart from the bulk storage tanks, significant quantities of these flammable liquid products are widely distributed around the world in process areas, pipelines, road and rail car loading bays, marine jetties for loading and unloading bulk ship cargoes.

Fires in these areas pose serious problems for both the professional fire fighter and fire design engineer, which grow dramatically the longer the fire burns. Large quantities of flammable liquids can become involved, which become increasingly difficult to control and extinguish the hotter they get. It is therefore vitally important to control and extinguish such fires quickly and efficiently.

By such swift action we can also minimise the loss of these precious and often non-renewable energy resources, that help generate valuable foreign currency on international markets. Let's now look at how we should protect these valuable assets, to ensure we achieve effective fire protection and minimise the consequential losses in an incident.

SHOULD FIXED FOAM SYSTEMS BE USED?

To answer this question our objectives must be determined. When fighting a flammable liquid fire it is important to initiate the **correct** action as soon as possible and there are two aspects to this. The first is to detect an incident at its earliest stage, and rapid detection is an integral part of effective fire protection. Effective detection is a whole subject area of its own covering conventional heat ,smoke or flame detectors and specialised linear heat detection, to the most modern Hart XL high sensitivity smoke detection for computer rooms, control rooms and sensitive electronic data storage areas.

These systems then link into specialised fire protection systems that take action to combat the fire using the right application measures as soon as it has been detected. A full evaluation of the hazards should have been carried out prior to the incident.

The most reliable means of ensuring that a fire fighting attack can be commenced immediately after an incident has been detected, is by ensuring that the fire protection equipment is already in position, which means having a fixed foam system permanently installed in the hazardous area.

When a fixed foam system is not fitted and a fire is detected, a large number of decisions must be taken to ensure that the appropriate action is initiated. Once the fire starts there is **insufficient time** to start calculating the logistical requirements to extinguish the fire. Calculations like:

- What are the required foam application rates?
- What are the water supply requirements?

Pic courtesy of Angus Fire

- What fire pump capacities will be required and how can we achieve them?
- How much foam concentrate will be needed?
- How can we correctly proportion the required foam quantities?
- What delivery equipment do we have to apply the foam – above the critical application rate?

- Can we get enough water pressure to project the foam onto the tank?
- Which way is the wind blowing?
- How close can we get, and is access restricted?
- Are there sufficient fire hoses in good condition?
- What about cooling surrounding areas to minimise the risk of escalation?

Evidently there is a need for a clear plan of attack, which can be calmly and precisely calculated, once a hazard has been identified and **before** an incident occurs. Fixed foam systems are planned in advance, and are designed to take a pre-determined course of action.

They therefore take the guesswork out of fighting a flammable liquid fire.

IS THERE A CREDIBLE ALTERNATIVE?

The alternative is simply to use traditional methods.

All but the smallest fires emit fierce radiant heat and although previously popular, traditional methods of using manually operated portable monitors do have some serious drawbacks.

Experience has shown that the use of mobile equipment takes appreciable time to set up, and requires numerous fully trained and experienced personnel throughout the operation who could be better utilised on other tasks. Monitors also demand much higher consumption of both foam and water resources – even under ideal conditions. International Standards call for 6.5 litres/metre^2/minute as a minimum application rate on hydrocarbon fuels. In practice this is likely to be substantially exceeded on larger areas with around 8–9 litres/metre^2/min. being more realistic. Even higher rates will be required for fires involving the more aggressive polar solvent fuels.

Why is this? With monitors, a considerable portion of the foam produced is wasted because it does not reach its target – the burning liquid surface. Reasons are as follows:

- Unpredictable wind effects on the day
- Updraft created by the fire itself
- Site access difficulties
- Water pressure fluctuations
- Restricted access for the foam stream to reach the fuel surface.

There is also the worry of where all this excess foam will end up – in local streams and rivers perhaps? The larger quantities being used are likely to have bigger impact on the environment and add to the cost of cleaning up the incident.

The proportion of foam that does reach the burning fuel surface will also be less effective because portable application necessarily produces a high impact velocity, forcing the foam to plunge down into the hot fuel. Inevitably, substantial fuel contamination occurs, resulting in reduced foam performance and greater risk of flashbacks and re-ignition. These factors are most prominent when synthetic detergent based foam concentrates like AFFF and AR-AFFFare used, explaining the predominance of natural protein based foams like FP, FFFP and AR-FFFP for efficient foam protection and excellent post-fire security.

When water miscible (polar solvent) fuels are involved, gentle application clearly assumes even greater importance than it does on hydrocarbon fuels.

Even under laboratory conditions, application rates for forceful impact are 1. 5 times greater than those required for more gentle methods. This will inevitably increase in a scaled up real fire situation where greater plunging, greater radiant heat and greater updrafts will occur.

ADVANTAGES OF FIXED FOAM SYSTEMS

Frequently the big fires we hear of being "successfully" brought under control are fought with "traditional methods" and take along time to extinguish. Every minute higher application rates of foam solution are being used, sizable foam stocks are consumed increasing the costs of extinction. Tremendous quantities of water must also be utilised. Numerous highly trained personnel are needed just to control these logistics, for many hours. Of course they quickly attract public attention too!

The longer the fire burns the larger the environmental impact and the larger the consequential loss is likely to be. Also, the greater the likelihood of news media attention publicising the incident.

Extinguishment costs climb rapidly as the cost of lost product increases. Potential damage and disruption to processes is increased along with the repair costs of adjoining plant and machinery.

Having a fixed foam system installed dramatically **reduces** all of these concerns.

Fixed foam systems are designed to take a predetermined course of action. They are ready to go at any time to provide quick, highly targeted and effective action, preventing the incident escalating out of control.

In many ways fixed and semi-fixed systems are victims of their own success – regularly they operate and extinguish fires, while they are still small. There is no drama because the foam system extinguishes the fire. It also provides valuable cooling and prevents reignition **before** it can have a large environmental impact, **before** it has drawn any media attention, **before** it has caused extensive damage to on-line processes or surrounding plant and **before** it has endangered personnel or incurred vast cost to bring under control.

Fixed foam systems can be your best friend, for each day they help to **minimise** the environmental impact of accidents involving flammable liquid storage around the world. Reducing the risk to site personnel as well as the

Road tanker loading bay protected by Angus Tanker Loading Bay Nozzles and FP70 Plus foam. Inset: K40 High Level nozzle.

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Process area protection provided by the self-aspirating Angus K40 Foam-Water Sprinklers and Alcoseal AR-FFFP foam providing a deep, high quality foam blanket which resists breakdown by subsequent cooling water sprays.

general public, reducing any legal liability and reducing the potential for media interest are all hidden benefits of fixed foam systems. At the same time they are working to **minimise** the disruption to other plant processes on site, **minimise** the cost of repair and **minimise** the product losses.

To be able to provide efficient protection in this way, fixed foam systems require three things from the end user organisation:

1. Initial commitment to invest in the installation of a professionally designed and engineered fixed foam system, using high quality components for reliability and long life. Cost cutting here can lead to inferior equipment or system design that will give problems later.
2. Run commissioning, trials once installed, to prove the correct action is being taken by the system. This is very important to satisfy senior officials and insurance companies that the system will work if needed.
3. Implementation of a system maintenance programme with full system testing – at least annually. Reliability, ease of inspection and low maintenance will be important decisions in selecting the equipment to be used in the system.

Of course this also applies to any associated detection system.

Taking all of these factors into consideration, as well as the question of containment and disposal of large volumes of potentially contaminated run-off water from the incident, the only answer to install a properly engineered fixed foam system for efficient protection of flammable liquid hazard areas, where ever they are, eg storage tanks, marine jetties, process areas, road and rail loading areas etc. A pre-planned fixed foam system takes the guesswork out of fighting a flammable liquid fire in any industrial hazardous area.

THE WAY FORWARD

The oil and petrochemical industry is now leading the move to increased usage of fixed foam systems for the protection of specific pre-determined flammable liquid hazardous areas.

Apart from the pre-planning advantages, other reasons are causing industrial complexes to increasingly rely on fixed foam systems. These include:

- Increased pressure in all industries to maximise production, save operating costs, and retain a competitive edge.
- Increased pressure from safety and environmental agencies for industries to minimise the environmental impact of fires, and spillages – particularly large ones.
- Multi-national companies are adopting consistent standards for their installations worldwide. This ensures each site is protected to a similarly high level, to minimise the risk.
- The need for high efficiency and uninterrupted operation of large plants is critical for success in today's competitive world.
- Industrial installations offer vulnerable high profile terrorist targets. These vital national assets require secure fire protection to minimise disruption.
- New plants are being protected to a higher level from the design stage to adequately protect the investment.

Fixed foam systems play an important role in achieving these objectives.

PROCESS AREA PROTECTION – Indoors

There are several ways of adequately protecting processing areas depending on how congested the modules are and whether they are indoors or outdoors.

Generally speaking for indoor process areas low expansion foam-water sprinkler systems are preferred, where a grid of compact stainless steel self-aspirating foam-water sprinklers are installed on a 3 metre matrix high up in the roof where there is low risk of damage during routine process operations. Typical flow rates of 80L/min at 4 bar g. operating pressures are required to give a minimum 6.5L/min/m^2 application rate for hydrocarbons. Higher application rates will be required where polar solvent fuels are involved using a multi-purpose AR-FFFP or AR-AFFF foam concentrate.The foam proportioning system is normally sized for at least 10 minutes duration with foam. Once the foam runs out the system then continues to operate with water only, to provide additional cooling for structural steelwork, piping and valving to minimise the risk of escalation should any small pockets of fire remain within the process unit.

If the process area is a very large space with few reaction vessels and little pipework where minimal water usage is required, then a High Expansion foam system may be more suitable. A fast acting detection system is preferred to allow fan driven Turbex high expansion foam generators to drive fresh air from within the area to mix with the foam concentrate and produce rapid flooding with large bubbles. A nominal expansion of 500:1 is most appropriate for hydrocarbon liquid protection to provide sufficient water within the foam bubbles to adequately cool the area and maintain control of the area. If the foam is too dry with even higher expansions it is less effective and re-ignition can more easily occur.

PROCESS AREA PROTECTION – OUTDOORS

For congested process areas outdoors the K40 type foam-water sprinkler system is also suitable, although wind may drift some of the foam outside the process area. Alternatively several


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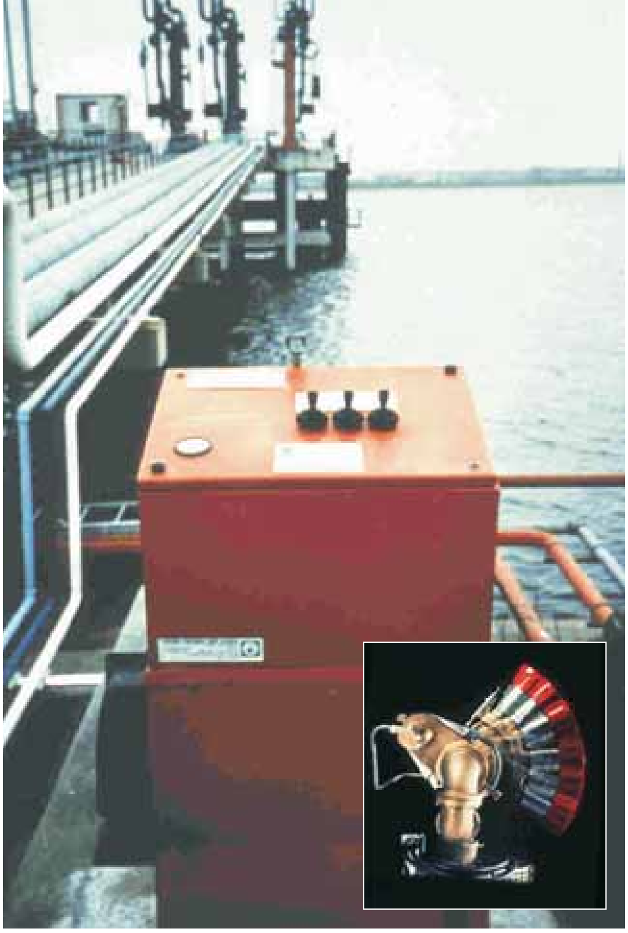
streamlined oscillating or manual monitors could be used with long throw non-aspirating nozzles to penetrate far into the process module, where the piping helps to aspirate the foam solution and reduce the impact velocity of the foam to minimise fuel pick-up into the foam blanket. Again a natural protein-based foam product will help to maximise post-fire security and avoid any emulsification of the hydrocarbons into the foam blanket which will occur with detergent based concentrates with the associated risk that hydrocarbons could get carried out of the plant in the fire run-off water and cause a potential pollution incident. or windy sites or foam cannons for wind protected areas to give a stable foam blanket. Higher application rates should be considered to overcome potetnailly adverse climatic conditions when the incident occurs.

For less congested areas Medium expansion FP or AR-FFFP could be a very effective solution, particularly if there is a bund around the process area to contain the foam inside. This foam will effectively bury pipework and flanging , keeping it cool from any radiant heat that otherwise could increase the risk of incident escalation.



Flammable liquid loading jetty protected by the Angus RCMh-80 Hydraulic Remote Control Monitors, controlled entirely hydraulically from up to 300metres away from the joystick operated control panel. Hydraulic pressure is provided by a water turbine driven power pack from the fire water mains feeding the Monitor. Inset: RCM1 monitor with multiple freeze positions.

ROAD AND RAIL TANKER LOADING BAYS

These are normally outdoors, often with some shielding from wind and rain for the operators. Foam-water sprinkler systems are widely used here with high level and low level tanker loading bay nozzles. The low level nozzles are used to throw aspirated foam under the truck (or rail wagon) to cover the spill fire beneath and also to cover the tyres.

These can be extremely effective and are normally operated from a bag tank for foam storage with a Balanced Pressure Proportioner to accurately introduce the foam concentrate.

An alternative approach would be to use low level oscillating monitors to sweep the area covering the pool fire and splashing foam against the tyres to extinguish and minimise risk of re-ignition. Care needs to be taken to ensure adequate time delay before operation as forceful foam streams from such monitors could incur injury to evacuating operators and truck drivers.

MARINE JETTIES

These are invariably outdoors in a windy and aggressive coastal environment. A pair of gunmetal Remote Control Monitors are generally recognised as the most effective and versatile protection for these hazards. The main purpose of these remote control monitor systems is to protect means of escape for crew members and operators from the jetty head, with the flexibility of control to allow system operation from a safe area off the jetty structure which may be 200-300 metres away from the remote monitors.

Full hydraulic operation is often preferred as this control method is intrinsically safe for Zone 1 hazardous areas and avoids the need for any other electric power supply, which is often the first thing to be shutdown in an emergency incident. Sufficient water pressure is generated via a water turbine in the control unit to pressurise the hydraulic lines and provide rotational, elevational and jet/spray control of the monitor form up to 300 metres away. Where protected emergency power supplies are present all electric or electro-hydraulic remote control monitor options could be used. It is important to ensure that the selected Remote Control Monitors have EExd IIB T6 rated flame-proof motors and other electrical components and junction boxes should be EExd/e IIB/C T4-T6 rated. It is also acceptable to have intrinsically safe Eexia components with zener barriers fitted in the control units. These specifications mean that all electrical components are safe for use in hazardous environments and cannot produce a spark that will ignite a potentially flammable atmoshphere in the hazard area during operation of the remote control monitors.

CONCLUSIONS

In order to optimise the efficiency of flammable liquid protection it is imperative to install fixed foam systems that will act quickly to minimise the scale of any potential incident and reduce the risks to life safety. Considerable importance should be given to ensuring that the specifications permit the very best performance to be obtained from these fixed foam systems and the leading specialist fire equipment manufacturers with Fire Engineering design capabilities are contacted to achieve this for you. One needs to remember that a good foam alone will not perform at its best through poor quality equipment, neither will poor quality foam produce the best performance from excellent equipment!

It is also important to ensure that any fixed foam system is initially commissioned to verify the initial design achieves the intended protection levels and is then regularly tested to verify that it is in a state of readiness to act in the event of an incident.

Fixed foams systems should be operated to produce foam at least annually, to ensure they are in a state of readiness to help you in your hour of need. Angus Fire are the global leaders in flammable liquid protection providing efficiently designed, high performing foams and equipment as well as the total system design capability required to protect the widest range of flammable liquid hazards.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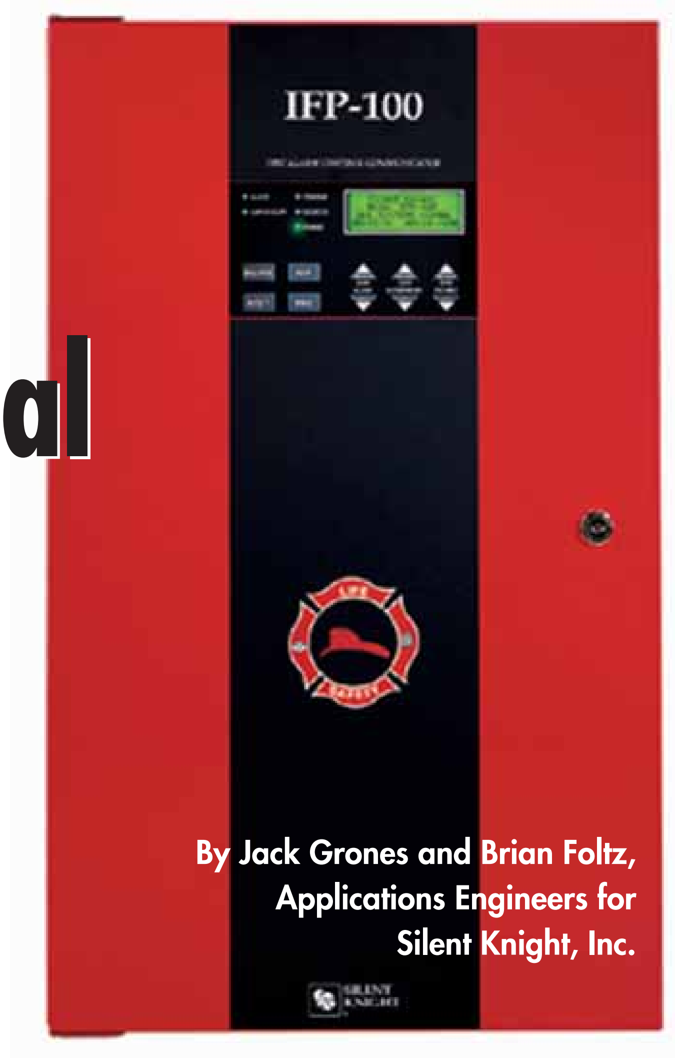
Analog Addressable vs Conventional Fire Alarm Systems:

Pinpointing the differences so you can better address your needs



By Jack Grones and Brian Foltz, Applications Engineers for Silent Knight, Inc.

Analog/addressable fire alarm control panels (FACPs), like the Farenhyt IFP-100 from Silent Knight, feature addressable devices or points that can be individually identified. Analog/addressable FACPs often include other capabilities. The IFP-100 features 127 addressable points, single button reset and silence functions, a built-in digital communicator, a programmable zone or point reporting capability, and an enhanced user interface.

THE TERM "CONVENTIONAL" connotes that something is commonly used or done. But this is a term that is extremely time-sensitive. Conventions change – the license to call something "conventional" runs out every few years. What was considered a conventional oven or telephone or radio or computer ten years ago is very different from today's "conventional" versions of these products. Even previously unconventional products like a cell phone have their own advanced offshoots with features like image transmission and Internet access.

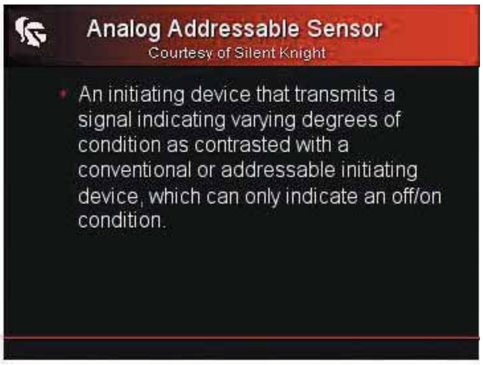
The point is, technology is advancing at heretofore unimagined speeds and it is up to individual buyers to determine whether "conventional" items meet their needs or whether they need to take advantage of newer technologies that veer from the norm.

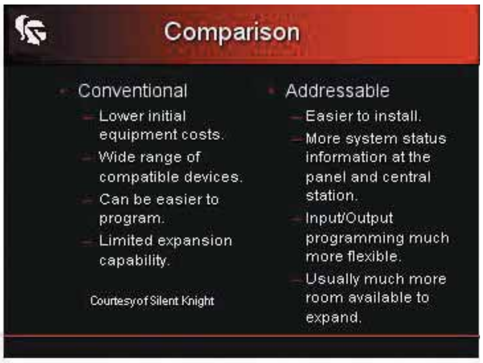
In the fire alarm industry, there are two principal options for fire alarm systems: conventional systems, and analog/addressable systems. As you might imagine, there was a time not too long ago when conventional systems were the systems of choice for most buildings. But with changes in technology, costs, perceptions and agency codes, addressable systems have gained momentum over the last ten to fifteen years.

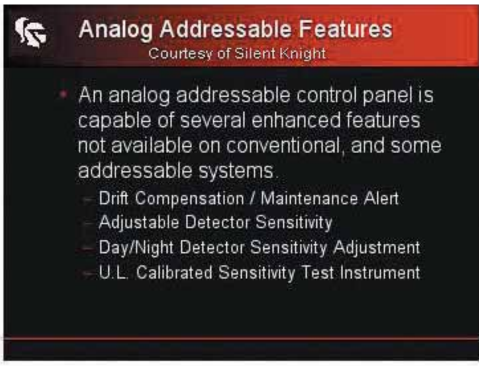
This article will help you understand the differences between the two types of fire alarms systems, with the ultimate goal being to provide you with the necessary information to make the best choice for you building's fire safety needs.

DEFINING YOUR OPTIONS

An "addressable" fire alarm system is one which provides the user with the status of the initiating devices that comprise the system network, be they smoke detectors, water flow switches, manual fire alarm boxes or other emergency equipment. This status is easily viewed on the fire alarm system control unit, and features not only information about the emergency device but also detailed information about the device's "address." Digital addresses for each device can be assigned by the system hardware or software. The location of an operated addressable device is visibly indicated according to building, floor fire zone, or other approved subdivision,







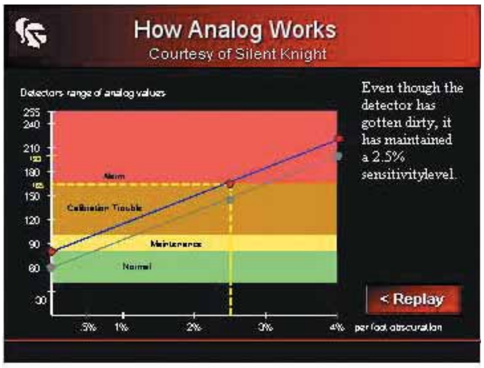
and also communicated via annunciation, printout or another chosen means of communication.

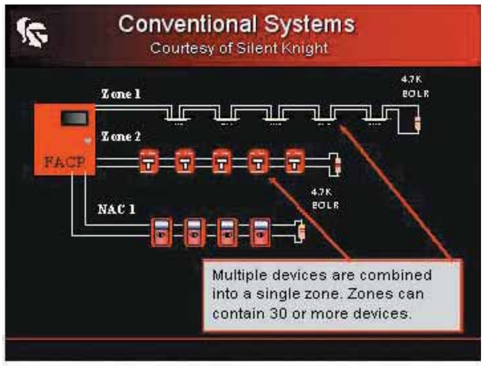
An "analog addressable" system takes addressable systems one step further. It has all the characteristics and features of an addressable system, but also expands on the information provided to the control panel. Detectors in an analog addressable systems become "sensors" that relay information to the control panel regarding how much smoke or heat the detector is sensing. The control panel is then able to make action-taking decisions based on this higher level of information, including when or when not to go into alarm mode.

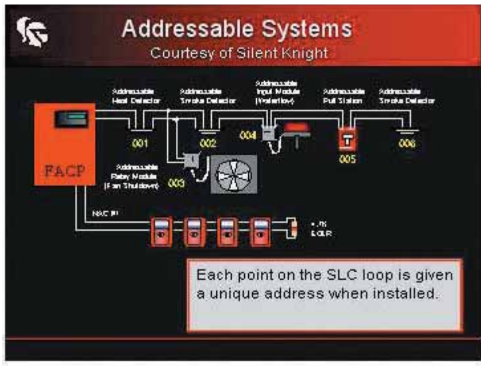
In simplest terms, the primary benefit of an analog addressable system, and the trait that separates it from conventional systems, is that it allows an exchange of data between the panel and the activated sensor or sensors. Conventional systems feature groups of initiating devices combined into individual zones grouped on a single loop and linked to a control panel. These systems feature lower initial costs, but deliver far less information about activated devices and are unable to identify individual trouble-spots. With conventional systems, it is up to the control panel operator to determine exactly where and why an alarm has sounded (and this is a process which could even involve physically exploring the building).

BREAKING WITH CONVENTION

Though conventional systems still find refuge in some smaller jobs, it is becoming far and large the job of the newer analog addressable systems to handle fire control safety for both small and large jobs alike. This is because advancements in technology make even small applications appropriate for analog addressable systems. Unlike older addressable systems, newer analog addressable products are just as easy to program as conventional systems, and are also easy to maintain. With the ease-of-installation and maintenance of the new analog addressable







An "analog addressable" system takes addressable systems one step further. It has all the characteristics and features of an addressable system, but also expands on the information provided to the control panel.

Guidelines for the Facility Manager When Buying a Fire Alarm System

1 Purchase a system that is appropriate for your needs. Don't overkill the problem.

2 Lay out the system in advance. Determine how many addressable devices you need, and what type: smoke detectors, heat detectors, relay modules, pull stations, and various monitoring switches.

3 Give yourself room to grow. If you need 25 devices, purchase a system that supports at least 15-20% more than that in anticipation of future growth.

4 Be sure that you feel comfortable with the system and its operation. The controls should be simple to use and laid out in a way that makes practical sense.

5 Buy a system that you'll be happy with for an extended period of time – at least 5 to 10 years. Be prepared to add on to the system before you have to replace it.

systems, they are fast becoming the choice of the future and will in themselves become the "convention."

Also, consider the safety issues. The NFPA has. The National Fire Protection Agency (NFPA), a preeminent code writing authority in the fire alarm industry, has recognized the safety advantages of analog addressable systems. In fact, according to Richard Roux, Senior Electrical Engineer for the NFPA, addressable multiplex devices are a significant improvement over non-addressable technologies.

One clear advantage is an analog addressable device's ability to pinpoint a fire's "address," greatly accelerating the potential speed of response. This information is not only annunciated locally but is usually also communicated digitally to the central station or fire department. There is no need to track down the activated device on foot to determine the proper course of action.

Also because detectors in an analog addressable system act as "sensors" that exchange information, the right action is set in motion immediately right at the control panel. The level of the sensitivity of these devices is completely at the system manager's control. One can lower the sensitivity level at night when it might be unmanned and raise it during the day.

CATCHING THE DRIFT

It is also important to note that analog addressable devices are far less prone to false alarms. Unlike conventional alarms which can get false readings from the accumulation of dust and other contaminants, analog detectors are able to self-compensate for these smoke-reading inhibitors. With this "drift compensation" analog detectors are able to distinguish between a long term drift in smoke detection due to contaminants and a short term change in smoke detection resulting from a real fire. Analog detectors can be adjusted when they are recognized as having become defective or dirty, so that system sensitivity can remain consistent and detectors can function at the proper levels day in and day out.

COMING DOWN TO THE WIRES

Despite their advanced capabilities, analog addressable systems are surprisingly simple to install and maintain. In fact, a complete analog addressable system can run a single pair of wires depending on system size. This is known as the SLC loop or Signaling Line Circuit. This type of system also allows the use of T-Tapping, which can not be done on a conventional system. Compare this with a conventional system which will have many pairs of wires all coming back to the main panel. Naturally, the installation of analog addressable wiring is easier, and the maintenance and trouble-shooting costs are dramatically lower.

Because of the simplicity of the wiring and the analog addressable system's ability to pinpoint a real problem (and separate it form a dust-related problem), maintenance calls require less manpower, take less time and are more likely to fix the problem the first time. This all leads to lower service costs, better performance and, as a result, improved life safety. The simplicity of the analog addressable system also leads to greater flexibility, both in terms of programming options and opportunities for expansion.

ADDRESSING YOUR UNIQUE NEEDS

Even within the realm of analog addressable systems, there are a great variety of features and options from which to choose. You need to pick the type of detectors that are right for your needs and budget, as well as the right control panel. And then you have to wade through all the available system features – everything from different interfaces to built-in digital communicators to automatic sensitivity checks and maintenance alerts.

What should be clear though, is that if you have a sizable facility to protect, the conventional fire alarm system is not necessarily the best option. In pursuit of maximum safety and value, more and more facility managers are breaking with convention and pinpointing analog addressable systems as their systems of choice.

One clear advantage is an analog addressable device's ability to pinpoint a fire's "address," greatly accelerating the potential speed of response.

Jack Grones has been with Silent Knight for 25 years as a Repair Technician, Technical Support Supervisor, and Applications Engineer. He is NICET certified.

Brian Foltz has been with Silent Knight for 18 years as a Technical Writer, Sr. Engineering Technician, and Applications Engineer. He is also in charge of Regulatory Compliance and is NICET certified.

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Why fire barriers and are vital to safeguar

By Mark Lavender,
Market Manager Fire Applications,
Promat UK Limited

Durasteel fire-resistant ductwork on the Jubilee Line Extension. This ducting is situated over a Durasteel smoke hood immediately above the tracks at North Greenwich Station

HIGH PROFILE FIRES have given new urgency to the question of fire protection in recent years. Saving lives is the bottom line. But it's also about trying to save the building and the business. Latest figures show 56% of British firms that suffer a fire go out of business within a year.

Onerous BS recommendations, Building Regulations, and the growing demands of insurers mean that fire protection is not an area where specifiers and building owners can afford to take a chance. Load-bearing columns, beams and floors must be proven to be fire-resistant. Fire compartmentation using fire barriers is now a vital component of building design.

Passive fire protection can help control the spread of a fire and limit the damage to a predetermined, acceptable risk. It gives occupants the time to escape and fire fighters a safe haven from which to fight the fire and a chance to stop the building's collapse. As buildings become more complex in their function, designers may need to implement fire engineering principles and strike a balance between active protection, such as sprinklers, and passive protection measures which are literally built into the building fabric.

Durasteel, the market leader in fire barriers and fire rated ducting, offers a complete containment system – a fit-and-forget solution that's been tried and tested under the most extreme conditions. This has resulted in specifications by key clients such as MOD, BT and London Electricity as well as by architects and mechanical design consultants for landmark projects such as Tower Place, the Jubilee Line Extension, Museum of Scotland, British Museum and various Hayes Logisitics sites.

Produced by Promat UK, Durasteel is a sheeting made from a core of composite fibre cement sandwiched between mechanically-bonded steel facings. Its exceptional fire protection is combined with lightness and durability. It can withstand prolonged exposure to fire – up to six hours – and, while hot, will withstand spray from fire-fighters or sprinkler action. Durasteel is also renowned for its impact and blast-resistance – particularly relevant in these troubled times.

Typical areas of use for Durasteel include distribution, storage and warehousing, military buildings, petro-chemical plants, airports, underground train stations, road and rail tunnels, utilities' installations and fire resistant ducting applications in major commercial and public assembly buildings.

Such has been the demand for Durasteel in 2003 that production capacity at Promat UK's Blackburn plant is being doubled. The company is also releasing new guides for the specification of Durasteel for fire barriers and fire-rated duct applications.

EXPERT ADVICE

There's a wealth of rules and regulations governing fire protection that specifiers need to be on top of. Fortunately, Promat UK is on hand to provide expert advice, also working with designers to achieve the most cost-effective solution without compromising performance.

To prevent failure of a fire compartmentation system, the protection must do more than simply stop the spread of flame and/or heat transfer. It must also withstand associated hazards such as water or impact, which can occur as the result of falling debris or fire-fighting action.

Insurers, through the Loss Prevention Council, also provide basic recommendations for compartmentation within the LPC's Design Guide for the Fire Protection of Buildings. British Standards, meanwhile, judges fire resistance as the performance of a complete construction, rather than an individual material. Through BS 476: Parts 20-24, 1987 the standard targets loadbearing capacity, integrity, insulation and stability.

Durasteel has been tested to comply with all relevant parts of BS 476. Durasteel barriers have been assessed for use up to 15m for fire and windloading.

EASE OF INSTALLATION

Durasteel sheet is available in 6mm and 9.5mm, with a standard dimension of 2500mm x1200mm, in galvanised mild steel or stainless steel finishes. In 6mm, it weighs just 16.8kg/m^2, and in 9.5mm just 21kg/m^2. Durasteel can be cut with a guillotine, jigsaw or grinder, and fixed with self-tapping, self-drilling screws.

Lightness and ease of installation makes Durasteel suitable for installation in existing buildings. In a typical partition application, two layers of Durasteel are set on steel channel tracks, sandwiching mineral wool between them. Steel studs located at 1.2m centres or at every board vertical edge fix the sheets to fillets and horizontal framing members.

The barrier can also be fixed as a single sheet. To achieve an equivalent level of protection using plasterboard would take 2-3 layers.

Projects include the Jubilee Line Extension for London Underground, where designers drew on the recommendations of the public enquiry that followed the 1987 King's Cross fire.

An example of where Durasteel was judged more cost-effective than a sprinkler system was in providing a fire barrier for a giant warehouse owned by Knights of Old, the Kettering-based logistics company. The local authority and fire brigade were worried about the clothing and household goods to be stored in the 4000m^2 building. They specified either a four-hour fire-resisting partition, or the installation of sprinklers.

The architects chose a Durasteel barrier – a 1000m^2 wall that worked out half the price of a sprinkler system. Durasteel engineers were involved in the design of the barrier. Its 4-hour fire rating was indepen-

fire-resistant ducting
d lives and business

dently tested and assessed by the LPC. Its impact resistance will also withstand the collapse of adjacent high racking into the barrier. As the barrier was low weight – just 27kg/m^2 – it was built off the existing concrete slab without the need for strengthening or additional foundations. A four-man team installed it in less than four weeks.

Over 17,000m^2 of Durasteel barriers were recently installed at a Hays Pro Logic document storage complex in East London, forming several 4-hour compartments with individual capacities of 40,000m^3. The Ministry of Defence makes extensive use of the barriers for materials and equipment storage.

DUCTING

In today's modern commercial and public assembly buildings, the use of fire dampers at fire boundaries could negate the life safety function of ductwork serving remote compartments. The function of ductwork in life safety mode is to remove smoke and the products of combustion safely from the building.

Fire rated ductwork must maintain full fire integrity, including retained cross section for smoke removal. The ductwork may contain the fire but if it's transferring sufficient heat, there's still a risk the fire can spread to adjacent compartments. Situated where the ductwork passes through a fire barrier such as a floor or a wall, the damper seals the ductwork should a fire break out. But this system can have its drawbacks. Used on dedicated smoke extracts or kitchen extracts, dampers would impede the ductwork's emergency functions. Also, on general ventilation for multi-compartment buildings, the structure would need to be peppered with dampers to ensure containment.

Fire-rated ductwork, such as Promat's Duraduct range, is the answer. Duraduct LT and SMT-Fireblast ductwork systems provide up to four hours protection to suit the demands of modern developments. Virtually maintenance-free, these are 'fit-and-forget' solutions for internal and external applications. They meet the demands of BS: 476 Pt 24, and of BS 7346 Pt 2, which governs the specification for powered smoke and heat exhaust ventilators

LT is a fast-track and economical system that combines the airflow and wipe-down characteristics of standard galvanised steel ductwork with the renowned fire protection and strength of Durasteel. It has been tried and tested for all fire rated duct applications. These include natural ventilation ducting, mechanical ventilation ducting, smoke extraction and non-domestic kitchen extracts.

Previous projects include HQ5 at Canary Wharf, Plantation Place in London and York's Monk Cross office development to name but a few. LT is made from galvanised steel inner ductwork topped with 6mm Durasteel and finishing trim angles. It is factory manufactured by Promat UK Limited approved contractors and delivered to site with minimal handling.

SMT-Fireblast is designed for potentially explosive environments such as electrical transformer and switch gear rooms. Its key characteristics include blast and impact resistance. Its applications include smoke control, protection of building services, lift-shaft protection and the pressurisation of riser shafts. Past clients in London include the Jubilee Line Extension, the Docklands Light Railway and the Tower Place office development

SMT is formed by fixing 9.5mm Durasteel sheets onto a steel skeletal framework. The sheets are then fixed with self-tapping screws and Promaseal mastic. The lengths of ductwork are bolted together, trapping the mastic between the mating flanges. It can be built in one, two, three or four-sided versions. This versatility saves space, time and material cost.

A further Promat ducting system, Duraduct SR, is used with LT and SMT for connection between the main smoke extract system and grilles where insulation performance is not needed. It can also be used for smaller cross-section extract ducts located within protected shafts. SR meets BS 476 requirements on stability and integrity for up to 120 minutes.

BACK-UP

Promat UK has a wealth of test evidence and further assessments for Durasteel. There are independent certificates to back up design documents, over and above the relevant standards.

Durasteel also complies with the growing number of tests demanded by big insurers, such as Lloyd's of London, US specialist FM Global and Canada's ULC. It even meets the requirements specified for marine applications by European risk manager DNV.

Promat UK's fire protection manuals are already well-known as the industry standard for fire-safe construction. Promat has offices and factories all over the world, forming a network of knowledge centres concerning fire protection and high temperature insulation.

In the UK, the company offers the country's only one-stop shop service for fire protection products. Its other leading brands include Supalux, Masterboard and Vermiculux high-performance fire protection boards.

Further details on Durasteel's fit-and-forget systems and technical assistance are available from: Promat UK Limited, The Sterling Centre, Eastern Road, Bracknell, Berkshire RG12 2TD Tel: 01344 381300 Fax: 01344 381301.

Pic courtesy of Promat UK Ltd

No Climb Products Ltd

Adequate maintenance is as critical as the original decision to install. Routine testing recommendations in the new BS5839 are intended for maintaining systems under normal circumstances, and of course reduce the number of false alarms.. Recommended re-acceptance testing, when the system is reactivated after new additions (detector heads, software etc) or after false alarm, fire, fault or disconnection ensures that there are no adverse effects on the overall system.

The new requirement of the BS5839-2002:1 standard states:

"Every heat detector should be functionally tested by means of a suitable heat source ... the heat source should not have the potential to ignite a fire; live flame should not be used"

Section 6. 45.4 c)

For customers requesting extra portability in heat testing, the popular Solo 461 Cordless Heat Detector Tester is ideal and has an adaption on request to enable testing of non-restorable detectors. Air is heated by an element and blown horizontally at the sensor, whatever size and shape of detector, saving substantial amounts of time.

- The cordless Solo 461 heat tester has no trailing cables and uses the same Battery Batons™ and universal access pole as other products.
- Its patented design is a solution for fast, yet controlled and safe testing.

For a cost-effective solution, new Solo 423/424 mains powered version incorporates a safety cut-out feature to protect the user and not damage the detector. The product does not contain a live flame and is lightweight to enable the user to test at heights easily and safely.

- Solo 423/424 is available in two voltage versions to suit any environment.
- It comes complete with a 5m cable so that service personnel do not waste valuable time fitting extensions on site.
- A 5m extension cable is also available if the power socket is located further than 5m from the testing area.

This cost-effective device is ideal for testing fixed temperature, rate-of-rise and combination type detectors. The 110v version (Solo 423) is in accordance with the requirements of the Construction (health, Safety & Welfare) Regulations 1996 and the Electricity at Work Regulations 1989, making it eminently suitable for use on construction sites.

Solo kits are available, which enables a complete functional testing solution for maintaining system detectors. Routine and non-routine testing can be carried out on detectors purely by using the professional tools contained within a Solo kit, whether for testing or removing smoke, heat or CO (Fire) detectors.

For more information please contact:

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Fax :+44(0)208 449 4029

How to 'insure' (sic) that you are covered and avoid ALCATRAZ!

So, have you spoken to your insurer recently about the cover for your building?

By Graham Ellicott, Chief Executive,
Association for Specialist Fire Protection (ASFP)

Perhaps you can't because he's gone out of business, or is no longer prepared to be involved with property insurance. Even if he is still around, he may be strongly re-appraising what risks he is prepared to continue to take on ... and YES, you could be one of the bad ones.

So, how do you move yourself into the low risk category? Well, with regard to fire it would be extremely prudent to make sure that you have carried out and acted upon a risk assessment. If you do not feel competent to carry out such an assessment with your own staff, then you are strongly advised to turn to a competent company to carry out the work.

This risk assessment should highlight all the deficiencies in the passive fire protection in your building. These are likely to include breached fire compartmentation, especially where new services such as computer wiring have been installed. In some cases there may not even be any compartmentation! Once you're happy that the systems are in place in the appropriate locations then things to look for with regard to the installed passive fire protection include the following:

- With intumescent coatings, check the dry film thicknesses. Some intumescents require special primers and topcoats and you should make sure that the correct ones have been used. If they are not, check that the ones that have been substituted are compatible with the intumescent itself?
- Board systems protecting structural steel may have different fixing systems for different ratings and the assessor should make sure that the appropriate one has been used. In particular, it should be ensured that all fixings are installed at the appropriate centres and if noggins are installed, check if they need adhesive, or was friction fitting sufficient?
- Spray applied cementitious products should be checked for thickness and bond to the substrate.
- Coated mineral wool batts are commonly used for barrier/penetration seal protection and the assessor should ensure that the appropriately coated product has been used and has not been substituted with an inferior mineral wool material.
- Where services pass through barriers there is often a requirement that they be supported for a certain distance on either side of the barrier. It may also be necessary for the appropriate fire protection product

Coated mineral wool batts are commonly used for barrier/penetration seal protection and the assessor should ensure that the appropriately coated product has been used and has not been substituted with an inferior mineral wool material.

How to 'insure' (sic) that you are covered and avoid ALCATRAZ!

As a Director or the owner of a commercial structure, you must be certain that the passive fire protection in your buildings is of the required standard. If not, in the event of a death in any of your buildings due to fire, you and/or your company may be prosecuted.

to be used to protect them for a similar distance. The assessor should make sure that these distance details have been adhered to and that any necessary in situ supports are composed of the correct material.

- Intumescent pipe closures and collars may be used in conjunction with plastic pipes. It is important that these products be properly installed. For example, are the collars securely fixed to the surrounding substrate? Care should also be taken to ascertain that the closure or collar has been tested/assessed on the type and size of plastic pipe to be protected.
- Once the initial risk assessment has been carried out you would also be advised to take a step back and consider whether your building has the right level of passive fire protection installed in the first place. I can hear people saying, but why should I bother with this when the building was inspected and passed by the relevant building control body? You would be strongly advised to consider it for several reasons. These include the possibility that the fire load within the building has increased since it was originally constructed, or the adjacent business' risks have increased, or your building is very old and it may no longer comply with the appropriate level of fire protection required by current Building Regulation. In addition, under the new Fire Service reorganisation, it is possible that the level of fire cover that your building will receive in future may be reduced. This should be borne in mind for future risk assessments.

Once the initial risk assessment has been carried out you would also be advised to take a step back and consider whether your building has the right level of passive fire protection installed in the first place. I can hear people saying, but why should I bother with this when the building was inspected and passed by the relevant building control body?

And yes there is more!

In the autumn, a new offence of corporate manslaughter will be introduced. But what does all of this have to do with passive fire protection? Well, as a Director or the owner of a commercial structure, you must be certain that the passive fire protection in your buildings is of the required standard. If not, in the event of a death in any of your buildings due to fire, you and/or your company may be prosecuted. More importantly, even if you are confident that the required standard of systems is in place, can you prove it? Such proof would include detailed risk assessments and the relevant documentation from the fire protection installer, verifying what systems have been installed and how they were inspected. If you can't prove it, then a spell inside one of Her Majesty's Prisons could become an unattractive possibility!

All in all, it will pay you to have risk assessments with regard to fire carried out as they could ensure that you are able to retain insurance cover at a reasonable price. In a worst case scenario they could prevent you becoming the next 'Birdman of Alcatraz'!

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A Review of Portable Fire Extinguishers

By Peter Freestone
Business Development Manager
Kidde Fire Protection Services

FOR MANY YEARS the most common means of tackling fires in the workplace has been from the provision of portable fire extinguishers. Indeed in many countries there is a legal requirement to provide fire extinguishers or maybe an Insurance Company has made it a mandatory condition of the Insurance policy. Whatever the reason and almost irrespective of size of workplace, portable fire extinguishers are universally accepted as providing the best chance of successfully tackling a small fire incident.

There are few appliances in the home or workplace that have retained their current design for as long as portable fire extinguishers. Apart from changing to operation in an upright, rather than an inverted position and the introduction of "controllable discharge" to the extinguisher operation, the current range of appliances has changed little over the past 30 years. Why is this? In a large part the national and international manufacturing standards applied to fire extinguishers have determined the current designs, together with the recognition that these appliances are required to operate at high pressure, also restricting design parameters.

Some change has taken place in extinguishing mediums used within extinguishers and in particular the introduction of additive performance enhancers to water extinguishers and most recently the introduction of a new type of extinguisher for commercial kitchen protection. These changes have also included advances in the design of discharge nozzle, with the development of fine droplet discharge for certain extinguisher models.

THE PROPELLANT

A number of fire extinguisher manufacturers offer a choice of propellant to discharge the extinguishing medium with the exception of Carbon dioxide which requires no propellant.The "stored pressure" design of extinguisher requires that the appliance be permanently pressurised with nitrogen or dry compressed air and therefore always ready for use.By contrast the cartridge design extinguisher relies on a carbon dioxide cartridge being pierced at time of activation with the carbon dioxide pressurising the extinguisher.Both methods of fire extinguisher pressurisation are equally effective and efficient for tackling a small fire and benefits can be identified for both types of extinguisher.

- Cartridge type extinguishers remain unpressurised excepting when operated and therefore can safely be internally inspected on each routine maintenance inspection.
- Stored pressure type extinguishers include a pressure gauge which indicates at a glance whether the appliance is ready for use or has been de-pressurised.

TYPES OF FIRE EXTINGUISHER

Fires are classified by Type:

Class A	Fire involving ordinary combustible materials e.g.: wood, paper, fabrics
Class B	Fire involving flammable liquids e.g.: petrol, oil or fat
Class C	Fire involving flammable gases e.g.: propane or butane

A Review of Portable Fire Extinguishers

Class D	Fire involving burning metals e.g.: magnesium or aluminium
Class F	Fire involving cooking oils and fats in commercial kitchens and Identified as Class K in the USA

No fire extinguisher is suitable for every fire classification and portable fire extinguishers are designed, manufactured and tested for use on certain types of fires.

Water based fire extinguishers are suitable for use on class A fires, foam based fire extinguishers are generally suitable for use on both Class A and Class B fires, while multi-purpose dry powder fire extinguishers are suitable for Class A, B and C fires. Although there is now no classification for an electrical fire, carbon dioxide extinguishers are suitable for fires involving live electrical equipment. Class K rated fire extinguishers for use with deep fat fryers in commercial kitchens use alkaline based wet chemicals.

Halon 1211 – BCF was widely used as a general purpose fire extinguisher until scientific evidence identified it as an ozone depleting agent and many countries as signatories to the Montreal Protocol have banned the sale or use of this extinguishant medium excepting for military and aviation use.

TEST RATINGS FOR FIRE EXTINGUISHERS

The different types of portable fire extinguisher are manufactured and supplied in a variety of sizes determined either by volume or by weight. For most fire extinguisher types, the size of the appliance will determine it`s effectiveness at extinguishing a fire of the appropriate classification. Extinguishers designed for use on Class A and B fires are given a fire rating based on Third Party testing of it`s ability to extinguish a test fire.

Class A ratings refer to the satisfactory extinguishing of a specified wooden crib with standard width and depth but varying length. E.g. 13A Test Rating = test fire wooden crib of 1.3metre length and 34A Testing Rating = test fire wooden crib of 3.4 metre length.

Class B ratings are determined by the volume of flammable liquid successfully extinguished for a test fire e.g.: 34B Test fire with 34 litres of burning flammable liquid.

Using additive enhancers to water based fire extinguishers combined with new designs of discharge nozzle, it has been possible to significantly reduce the size of water type fire extinguishers and yet still maintain the same fire fighting capability. As a result there are now 3 litre size water additive extinguishers available on the market with an identical fire test rate as a conventional 9 litre Water extinguisher.The reduced weight capacity makes the appliance more `user friendly.`

SELECTION AND SITING OF EXTINGUISHERS

A number of countries publish guides or codes of practice relating to the selection of both type and quantity of fire extinguishers. Reference should be made to these codes of practice in the selection of suitable and appropriate fire extinguishers and where they should be sited. Wherever possible the fire extinguishers should be securely fixed to a wall using a wall bracket with the operating handle at approximately 1 metre above floor level unless local circumstances determine otherwise. The appliances should be visable and clear from obstruction at all times.

More and more countries are adopting fire safety legislation requiring `self assessment based on risk` with responsibility for compliance placed squarely on the employer. There is a real danger that employers may fail to adopt the recommendations of the published guides and codes of practice and thereby reduce the provision of portable fire extinguishers which would be detrimental to the safety of their employee's.

MAINTENANCE AND PERIODIC TESTING

Portable fire extinguishers are a vital safety appliance providing first aid fire fighting in the early stages of fire. However because all fire extinguishers operate at relatively high pressures they can become potentially harmful, and on rare occasions, can prove to be fatal to an operative unless they are regularly maintained. Employers and persons appointed as responsible for fire safety in the workplace should undertake routine checks of the portable fire extinguishers to confirm they are correctly located, unused and not damaged.To ensure the extinguishers remain operational in an emergency and safe for use, each appliance should be annually inspected by a "competent person" and periodically discharge tested in accordance with the appropriate maintenance code of practice or regulations.

The emphasis placed on "competent person" can not be over stressed as the potential for harm due to ignorance or incompetence is almost unthinkable. Any individual undertaking maintenance and periodic testing to a portable fire extinguisher should have the necessary tools and equipment and be sufficiently trained to undertake all

> *The emphasis placed on "competent person" can not be over stressed as the potential for harm due to ignorance or incompetence is almost unthinkable.*

A Review of Portable Fire Extinguishers

work in accordance with the maintenance standards, code of practice and manufacturers recommendations.

In the UK a Third Party Scheme to verify competence of a fire extinguisher service technician is provided by BAFE – The British Approvals Fire Appliances. For UK employers, choosing a service organisation with BAFE approved technicians, is the best passport to ensuring that their fire extinguishers will be both operational and safe for use.

Critical to the safe use of portable fire extinguishers is that there is no evidence of internal or external corrosion or damage to the extinguisher body. Failure to detect such corrosion or damage and condemn the appliance as unsafe for use, could have fatal consequences, if the appliance is operated. It is the responsibility of the `competent person` to ensure that potentially harmful extinguishers are identified and condemned at time of service. Just like any other manufactured product, fire extinguishers should not be expected to last forever and while in many cases they may never be used they must always be in optimum working order. The `competent person` should identify fire extinguishers when they become unserviceable and recommend appropriate replacements.

TRAINING

UK fire safety legislation in common with other countries requires that employees are given adequate training on the types and usage of fire extinguishers in their workplace. However the provision of fire extinguishers in the workplace does not imply that employees must use them to tackle a fire.The recommendation is that, on discovering a fire, an employee should only use a fire extinguisher if trained to do so and only if there is an expectation that the fire can easily be extinguished without taking personal risks.

RELEVANCE OF FIRE EXTINGUISHERS

Too often the relevance of fire extinguishers in the workplace has been under estimated both by Employers and professional Fire Fighters. Some employers have viewed fire extinguishers as a grudge purchase and often Fire Service personnel have instructed that individuals should not attempt to extinguish any fire, no matter how small, but instead should immediately seek their assistance.Those of us who have been employed in the fire extinguisher supply and maintenance business for a number of years know that the relevance of fire extinguishers in the workplace can not be understated. In 2002 FETA (Fire Extinguisher Trades Association) and IFEDA (Independent Fire Engineering & Distributors Association), both highly respected UK fire trade associations, published a survey on the relevance of portable fire extinguishers. The survey used data from the UK and other European Countries with membership of Eurofeu.

The survey considered a total of 4800 separate fire incidents in Austria, Belgium, France, Germany, the Netherlands and the UK where portable fire extinguishers were known to have been used.

In 83% of these fire incidents a portable fire extinguisher successfully extinguished the fire. Furthermore in 75% of fire incidents documented in the survey, Fire Brigade attendance was not required.

The survey affirms that portable fire extinguishers are designed to prevent relatively minor incidents turning into major conflagrations and that their use on small fires often goes unreported and is therefore not identified in nationally published fire statistics.

Based on the survey results FETA and IFEDA jointly report that portable fire extinguishers are estimated to save the UK economy over £500 million and prevent some 24 deaths and 1,629 injuries a year.

It's Always In Beijing

CHINA FIRE 2004

China's 10th Fire Equipment Technology Conference & Exhibition is going to be carried out ceremoniously in the theme of "**Innovation, Cooperation & Development**", hosted by China Fire Protection Association in October 19–22, 2004 in Beijing, P. R. China. Being a superior event of the field, China Fire aims to provide a golden platform for peers from all over the world to expose their products, exchange their views and make cooperation, especially on aspects of product information, technical innovation and industrial development.

Since 1986, CFPA has organized **CHINA FIRE** every other year in Beijing, China, and 9 in total successfully. **CHINA FIRE** enjoys a worldwide reputation, meanwhile, extends its influence on the fire protection industry internationally. The latest **CHINA FIRE** was held in 2002, with an exhibition area up to 25,000 square meters, and over 300 exhibitors (fire protection product manufacturers and academic institutes) from 15 countries and regions, bringing along with their high-tech products and technology, including 24 categories and thousands of types and models. Over 70,000 visitors from 30 countries and regions were attracted to the event to discuss their business. Top officials from the State Council were invited to cut the ribbon at the opening ceremony. Heads of overseas civil fire protection organizations and embassy officials from foreign countries also attended. Officials from relevant authorities in charge of fire safety, finance, public security, insurance, planning, construction etc., over the nation were invited to the event and made government procurement. During the event, we also carried out series of technical and academic seminars with great success.

As China accelerates its pace in economic reform, the nation is undergoing speedy development in economy and city construction, and the Government has been making more and more investments on improving fire protection facilities and equipments for our cities. Beijing has been honored to host Olympic Game in year 2008 and the scale of infrastructure construction of this great event is estimated to be up to US$ 45 billion. Shanghai will be the host of World EXPO 2010. The new wave of construction is calling for a considerable amount of high-tech fire protection products and creates a potential market for fire safety industry. Hence it is a perfect time for overseas fire protection enterprises and manufacturers to join this promising and enormous market.

CHINA FIRE 2004, a great event full of opportunities and hopes. We here ensure you our sincerity in cooperating with fire protection manufacturers and experts from both home and overseas and making every effort to contribute to the development of the industry.

Sun Lun
President, China Fire Protection Association

ABOUT CHINA FIRE PROTECTION ASSOCIATION

CHARACTER

- CFPA is a legally registered national social organization, an academic and non-profit society formed by those who are engaged in fire technology, fire science, fire research and education, as well as fire protection enterprises.
- CFPA is an organization member of China Association of Science and Technology.
- The members of CFPA are composed of personal members, group members and foreign members. There are more than 30,000 personal members coming from all the places of the country, and over 2,300 group members.

MISSION

- To extend fire academic exchange and promote the development of fire science and fire engineering.
- To undertake or participate the evaluation and attestation on fire science and technology project, and the drafting and amendment of fire codes and standards.
- To organize conferences, seminars, exhibitions and technical training relating to fire science and technology, and promote the advanced fire technology and products locally and overseas.
- To facilitate the cooperation and exchange of information relating to fire science and technology internationally, and develop the friendly relationship with foreign fire protection association, organization and individuals.

EXECUTIVE OFFICES & COMMITTEES

CFPA is established as 4 offices, 3 executive committees, 7 professional committees, 4 fire protection sub-guilds, and a special committee composed of local well-recognized experts as well.

CFPA publishes three journals, and host one website **www.china-fire.com.**

CFPA develops international communions and activities together with foreign organizations as follows:

- National Fire Protection Association, USA
- Japan Firemen's Association
- Association for the Promotion of the German Fire Safety -vfdb-
- Fire Protection Association of Australia
- France Association of France-China Fire Friendship
- Korea Fire Safety Association
- Association of Philippine Volunteer Fire Brigades, Inc.
- Australian Building Codes Board
- Federation of World Volunteer Firefighters Associations
- Confederation of Fire Protection Association – International
- International Association for Fire Safety Science
- Federation Nationale des Sapeurs-Pompiers de France

g – China Fire 2004

EXHIBITOR SHOWCASE OF PRODUCTS & TECHNOLOGIES

- Communication & Lighting Equipment for Firefighting
- Emergency & Rescue Tools and Equipment
- Extinguishers
- Fire Engines, Fire Boat, Fire Tank, Fire Planes, Fire Robots
- Fire Detectors & Fire Alarm
- Fire Pumps & Valves
- Fire Hydrant, Fire Gun & Monitor
- Fire Doors & Curtains
- Fire-stops, Fire Coating & Spray
- Fire Resistant Elements & Accessories
- Fire Apparatus for Petrochemical, Forest & Aviation
- Fire Engineering Design & Installation
- High Effective Extinguishing Agent & Equipment
- Hose & Nozzle Equipment
- Protective Clothing & Breathing Apparatus
- Smoke Control Systems & Poison-proofing Equipment
- Sprinkler Systems

TOPICS FOR TECHNICAL SEMINAR

1. Fire Technology for High-rise & Large Space Buildings
2. Fire Technology for Petrochemical Industry
3. Technology & Application of Fire Detection, Alarm & Extinguishing Systems
4. Fire Technology for Energy Sources & Transportation
5. Firefighting Communication Technology
6. Fire Fighting Apparatus & Appliances
7. Research & Application of Fire Retardant Products & Materials
8. Fire Protection Product Standards & Testing Technology
9. Fire Protection Theory
10. Emergency Response & Fire Protection Measures

Information Center

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ADVANTAGES

- **CHINA FIRE** is the most impressive and superior fire protection exhibition in China on an international level, with the largest numbers of exhibitors and visitors from domestic and overseas.
- **CHINA FIRE** is the perfect combination of new products display, technical seminar and business cooperation. It is an international platform for fire enterprises to carry out technology innovation, technical and academic exchange and business discussion.
- **CHINA FIRE** attracted over 70,000 visitors in year 2002, who came from industries/institutes/relevant authorities relating to fire safety technology, products and equipment all over the country.
- **CHINA FIRE** is not only supported by Fire Department of Ministry of Public Security, the supreme authority for fire protection in China, but also by international well-know associations i.e. NFPA, Association for the Promotion of the German Fire Safety -vfdb-, Japan Firemen's Association, Korea Fire Safety Association, France Association of France-China Fire Friendship etc.
- **CHINA FIRE** has been carried out 9 times since 1986 with great success, keeping a long-term cooperative relationship with international fire protection enterprises and organizations.

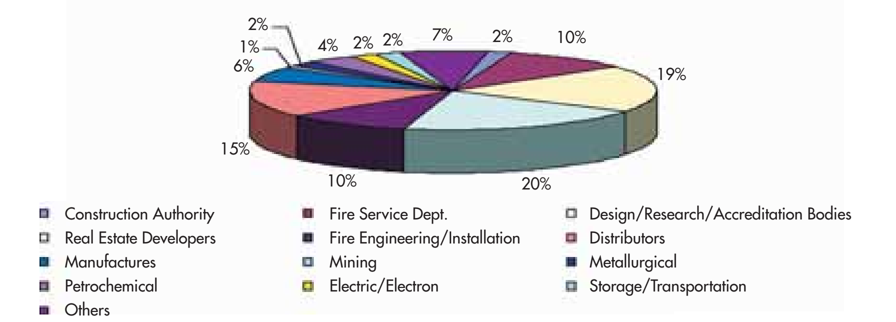
OTHER SERVICES*

Designated transportation agency offering professional services for the exhibitors with transportation and Customs declare for the items on display.

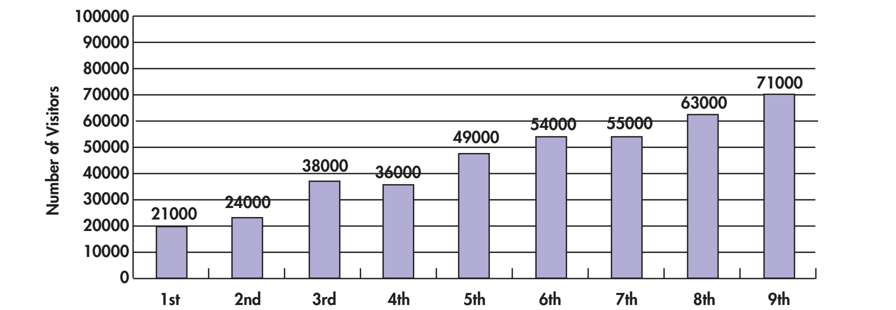
Designated contractor offering qualified on-site installation and decoration.

*Please contact us for further information.

Statistic of Visitors Composition of China Fire 2002



Statistic of Visitors of Previous China Fire



Based on the success and experiences achieved from the previous 9 shows, China Fire Protection Association would like to offer our professional service as always, providing the best platform to fire protection enterprises for spreading your information, to discuss your business and exchange professional views with each other, as well as a vast arena to expose advanced fire technology and fire protection products.

Trends in fire detection

By Stuart Davies
System Sensor Europe

Series 300 conventional photo-thermal detector with remote test

THE FIRE DETECTION industry is extremely innovative; the major detector manufacturers are continually developing new detection methods and improving existing technologies in order to provide better performance. The ultimate goal of instantaneous detection of a real fire combined with zero false alarms arising from environmental disturbances is unlikely ever to be realised, but today's fire detectors are orders of magnitude better than those available only a few years ago.

CONVENTIONAL AND ADDRESSABLE FIRE DETECTION SYSTEMS

The fundamental difference between the two types lies in the ability to identify the location of any specific detector. In a conventional system, the control panel can only give a general location accurate to a single fire zone; in an addressable system, each detector and module has a unique address.

The choice between the two system types is relatively straightforward at the two extremes; conventional systems are normally more than adequate in small installations, while analogue addressable systems are the norm in large premises. The most difficult choice to be made between conventional and analogue addressable systems lies somewhere in the middle, where both could be applicable. This boundary is not a fixed point; it has steadily fallen as lower cost computing power has made the analogue addressable system a cost-effective alternative in smaller systems. In 1990, the boundary was above twelve zones; by 1995, it had fallen to eight to ten zones; today it is close to six zones.

The recent past has seen development effort from the majority of fire detector manufacturers concentrated on their analogue addressable product ranges. Analogue addressable fire systems offer distinct advantages over conventional ones, particularly in larger and more complex installations, where the installer, the building's occupants and the emergency services all benefit from the inherent sophistication and consequent increased functionality and discriminatory abilities of the analogue addressable system. To go back to fundamentals: the primary purpose of a fire system is to detect a fire and subsequently warn the premise's occupants and the Fire and Rescue Service; by providing as early a warning as possible, the occupants have the best chance of avoiding injury and damage to the building will be minimised. As our understanding of fire has grown over the years, so fire systems have become more sophisticated, with different detection methods characterised to particular sorts of fire. All detector developments are intended to improve the speed of response to a real fire without increasing the frequency of false and nuisance alarms.

The total installed cost of a fire system is heavily dependent on the size of the installation. As a general rule of thumb, in systems with more than six fire zones, an intelligent system is more cost effective, because the higher cost of the analogue addressable detectors and control panel is more than offset by reduced installation costs and ongoing service benefits. By enabling both detectors and sounders to be connected on the same loop, the wiring requirements are reduced even further, a significant factor in large or multi-floor buildings. In such larger systems, not only is the initial cost of installation lower, but also the functionality of the system is increased. Control panels can normally be networked, either in a peer-to-peer or master-slave configuration, enabling one system to monitor large and multi-building sites. The fire system can also be more closely integrated with other building service systems such as security, access control, environmental control, heating and lighting.

TECHNOLOGY TRANSFER

Although the higher unit prices that could be achieved made analogue addressable product development a more attractive proposition for the majority of smoke detector manufacturers, the widespread availability of powerful low cost processors that can be embedded in the detector head have allowed detector designers to extend intelligence into the heads of the latest conventional detectors. Historically, a conventional smoke detector was no more than a simple on-off switch with a single, factory-preset alarm threshold. It was impossible to characterise the device to its location by adjusting the threshold and the only sensitivity adjustment option was to replace a smoke detector with a fixed or rate of rise thermal device. Now,

Series 200 plus addressable photo-thermal sensor

intrinsic intelligence in the head provides users and installers with features and capabilities previously only found in more complex addressable detectors. The latest generation of conventional detectors feature automatic drift compensation, adjustable sensitivity, multi-sensor technology and other advances such as remote interrogation and test. A far cry indeed from the original "on-off" switch.

FIRE DETECTION TECHNIQUES

The techniques employed for fire detection can be separated into the following categories:

Smoke detectors:
either ionisation or photoelectric principle

Heat detectors:
either rate of rise, fixed temperature or a combination of both

Flame detectors:
UV or IR principle

Gas detectors:
unsuitable as a stand-alone fire detection technology, but some manufacturers are starting to incorporate CO detectors into multi-sensor devices

OPTICAL VERSUS IONISATION DETECTORS

For most applications, the smoke detector provides the best combination of early detection and the minimum of false alarms. The first smoke detectors were the ionisation chamber type, very good at detecting small particles of combustion, but susceptible to false alarms caused by changes in humidity, air pressure, temperature and air velocity. In addition, legislative factors are making radioactive devices economically less attractive. It is becoming harder to obtain approval for an ionisation detector, and the regulations surrounding the transportation of radioactive materials are becoming more stringent and consequently more expensive. End of life disposal, which typically has to be undertaken by the original manufacturer, is a further significant and increasing cost. In some countries ionisation detectors are completely banned.

Advances in technology meant that it became cost effective to produce a fire detector based on the photoelectric principle and this product has now overtaken the ionisation detector as the preferred technology. The photoelectric detector operates at the other end of the smoke detection spectrum to the ionisation detector in that it detects large particles of smoke more effectively than small ones. The photoelectric detector is relatively immune to environmental changes, although it can be fooled into seeing smoke from sources other than fire. However, the characteristics of the ionisation detector make it more effective than a photoelectric device where, for instance, fast flaming fires are expected. The need to replace the ionisation detector with a more environmentally friendly alternative was one of the primary drivers behind the development of multi-sensor detectors.

MULTI-SENSOR DETECTORS

Historically, only a very few manufacturers produced composite detectors. These units were independent smoke and thermal detectors in a common housing; both were connected to the control panel and an alarm signal generated if either unit exceeded its threshold. However, this approach does not match the performance of an ionisation detector.

Today's multi-sensor detectors, now manufactured by all the major suppliers, are very different. Whether conventional or addressable, the devices use signal processing embedded in the head to enable an alarm signal only if the composite output of the two detectors justifies the decision. Multi-sensor detectors give the ultimate in protection against both slow and fast developing fires. They are true multi-criteria units; the output levels from both the optical chamber and the thermistor are continually monitored by the onboard processor, using algorithms developed specifically for the task. An alarm signal is only enabled in the detector once the processor is satisfied that an incipient fire has been detected. By using a combination of inputs, the incidence of nuisance alarms is reduced while at the same time, the response time to an actual fire is not impaired.

COMBINED SMOKE, HEAT AND GAS DETECTORS

It has long been known that gas detection can be an effective sensing technology in a fire detector. However, as a single sensor solution, CO detectors are unable to meet all of the criteria of a general-purpose fire detector; gains in false alarm elimination are lost in fire detection performance. CO detectors are not suitable as stand-alone fire detectors for two main reasons: the electrochemical cell is not fail safe in that it can become very insensitive without any noticeable change in its clean air performance (although technology is improving in this area) and not all the EN standard fires produce sufficient quantities of CO for successful fire detection to be guaranteed using a single sensor.

Research has shown that a multi-sensor incorporating at least one gas element, a photoelectric sensor and a heat sensor offers substantial performance advantages. Suitable technology has started to evolve and combination smoke-heat-CO detectors have been recently launched on the market with some success; they claim enhanced performance with respect to false alarm elimination.

HIGH PERFORMANCE POINT DETECTORS

In applications such as manufacturing clean rooms, telecoms facilities, hospital high-tech diagnosis equipment areas, data centres, computer suites, control rooms and other high value environments where there is substantial cost for downtime or a significant investment in installed equipment has been made, it is imperative that any fire is detected at the very earliest time. Given that such

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Pinnacle addressable laser photoelectric sensor

environments will normally be temperature and humidity controlled with dust filtered out of the atmosphere, it is possible to increase the sensitivity of the smoke detector quite dramatically without running the risk of frequent nuisance alarms.

Traditionally, the technique used to achieve very high sensitive coverage in a specific area has been the aspiration system. A dedicated network of pipes is installed in the protected areas and air is sucked through the pipes to a remote detection chamber that contains a highly sensitive optical smoke detector employing either an LED emitter, or, in later versions, a laser as the light source.

However, although aspiration systems are extremely effective, they do have their disadvantages which should be considered when performing a risk assessment and determining the appropriate protection technology. An ultra-sensitive photoelectric point smoke detector using a laser instead of an IR LED as the light source is now available. The laser detector is a very sensitive and extremely stable sensor that provides up to 100 times more sensitivity than a standard LED device. It has a significant number of advantages over the aspiration system approach. The source of smoke is identifiable to a single detector rather than, as is the case with an aspiration system, a general area. As one detector within an addressable fire system, the laser detector is fully supervised and can be mixed on a loop with all other types of smoke and heat detector. It is interchangeable into the same base as any other addressable sensor on the loop, enabling the fire protection system to be upgraded at minimal cost for those areas within the building that require the highest levels of protection.

BEAM DETECTORS

To protect large open spaces such as shopping centre atriums, concert halls, historic buildings and warehouses, infrared beam detectors, consisting of a transmitter and receiver either separately mounted or contained in a single enclosure, provide effective smoke detection by means of an emitted infrared beam that is returned to the detector from a reflective panel located between 10 and 100 metres away.

Testing and routine maintenance of beam detectors mounted at high levels has always presented a problem because of the difficulty of access, the cost of erecting high level platforms and the disproportionately high labour costs incurred in carrying out the routine test. A unique solution to this problem is currently in development and will be announced as soon as the approval exercise is completed.

WIRELESS DETECTORS

Traditionally, the use of wireless communications in fire systems has been regarded with suspicion for several reasons: limited battery life, potentially insecure and unstable communications between detector and panel and the industry's innate conservatism making it reluctant to use an untried technology in life safety systems. The technical barriers have now largely been overcome and the entry of some major manufacturers into the market has given the technology significant credibility. The detector/loop module approach has emerged in the market, enabling wireless technology to be installed in appropriate areas as part of a hybrid hard-wired and wireless system. The installation advantages, particularly in historic buildings and other applications where running cables can be difficult, are self-evident. A niche technology at present, but one which has much potential.

MODULES

Fire systems are increasingly required to communicate with other systems and equipment within the building. To achieve this, I/O, monitor and control modules are used to supervise and activate sounders, strobes, door releases, break glass call points and other ancillary devices; they provide loop protection in the fire system itself, are used to interface between an intelligent fire system and a conventional two-wire installation and to interface with external systems.

Unfortunately, there are no European harmonised standards for modules; therefore, national standards – where they exist – need to be considered.

CONCLUSIONS

As an important part of the life safety industry, the world's fire detector manufacturers are constantly improving their products to increase the levels of protection afforded to the users of the buildings they protect. An example of the benefits of applying advanced technology, the latest devices provide increase protection at lower cost than ever before – and no doubt, the advances will continue in the future.

Addressable modules

Stuart Davies has more than thirty years experience in the Fire & Security industry. Before joining System Sensor Europe European Marketing Manager in 1999, he was with Honeywell Control Systems; he has previously worked for major international organisations such as Thorn, Wormald and How Group, with responsibilities covering applications, engineering, sales, marketing and general management.

Patterson Fire Pumps What the Industry Relies on These Days

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Patterson continues to be the industry leader in prompt delivery of all standard model fire pumps worldwide. Four types are offered, for anything from small commercial establishments, to mid-range fire service, to large installations with existing wet pits. Choose from horizontal split case, vertical turbine, vertical-in-line or end suction models, or choose our highly efficient Pre-Pac® prepackaged fire system. Our new Patterson Engine Package (P.E.P.) combination diesel engine/fire pump controller greatly reduces the overall size and complexity of usual setups.

Patterson reliability is enhanced by coordinated training in proper operation and maintenance of fire pumps at our training facility in Toccoa.

Whether a complete rebuild, a single O.E.M. part requirement, or simply a question, Patterson stands ready to give personal field and factory service, as required, to maintain our reputation for providing the best service in the industry.

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Patterson Pumps . . . A

Patterson Pump Company continues to be the industry leader in prompt delivery of fire pumps worldwide, providing horizontal split case, vertical turbine, end suction and vertical-in-line pumps, with electrical motors, diesel engines or dual drive combinations.

Patterson's manufacturing philosophy is totally dedicated to having its pumps arrive when promised, allowing customer's new construction or retrofit projects to stay on time and within budget.

A subsidiary of The Gorman-Rupp Company, Patterson Pump Company is ISO 9000 certified, and has implemented a Six Sigma optimized quality level program. These attest to its world-class quality and dependability. The company has committed countless dollars to maintaining its leadership role, and its long-standing record of product reliability through expanded production fabrication facilities and the latest in high tech, computer-aided fabrication tools and techniques.

The company's industry standard fire pumps are UL and ULC/cUL listed, FM and NYBSA approved, and meet the requirements set forth by the National Fire Protection Association (NFPA-20) in the western hemisphere.

Patterson Pump Ireland Ltd.

Patterson's European subsidiary, Patterson Pump Ireland Ltd., is ISO 9000 certified with its industry standard fire pumps being UL and FM listed, LPCB, VdS and CNBOP approved, and meet all requirements set forth by NFPA-20 and the European Local Rules Market countries. All Patterson fire pumps conform to, and in most cases surpass, the standards set forth by these approving agencies and listing authorities.

This independent European manufacturer is headquartered in Mullingar, County Westmeath, Ireland, where it builds, fabricates, assembles and tests all types of Patterson fire pumps. The company has sales offices in Europe, the Mid-East and the Far East, and a network of sales representatives around the world.

Patterson Pump Ireland services its customers worldwide from sales to order entry, to manufacturing and testing, to shipping and on site commissioning.

A Complete Line of Fire Pumps

A complete range of pumps is manufactured at the Mullingar facility – prepackaged Pre-Pac® pumps, as well as a Patterson Engine Package (P.E.P.) combination diesel engine/fire pump controller. In addition, PPI can convert a container into a fully operational house.

Horizontal Split Case Pumps

Precision balancing of all factors in the design of Patterson Horizontal Split Case Fire Pumps provides mechanical dependability, efficient operation and minimal maintenance. Simplicity of design ensures long, efficient unit life, reduced maintenance costs and minimum power consumption.

They operate with pressures in excess of 390 psi (27 bar) and up to 5,000 GPM (18,925 L/M).

High Pressure Two-Stage Fire Pumps

High pressure Two-Stage Fire Pumps are engineered to produce as much head as two single-stage pumps in series, and are much more compact in size. Heavily built, they are highly efficient and have every mechanical feature to assure long and reliable service.

Designed in sizes from 3″ (75 mm) to 6″ (150 mm) discharge, for capacities to 1,000 GPM (3,785 L/M), and for heads up to 1,150 feet (34 bar), they represent the most economical pumping equipment available for rugged and reliable service.

Vertical In-line and End Suction Series Fire Pumps

Patterson's V.I.P. In-line and End Suction Fire Pumps are designed for ease in adapting to existing systems or being designed into new systems in safety applications. Their ease of installation into pipe lines eliminates the need for costly foundations or pads. Standard piping supports on either side of the pump are all that is required.

Vertical In-line suction and discharge flanges are on a common center line, 180° apart, for mounting in the pipe line. End Suction Pumps have center line suction and discharge.

Both the pump types feature full ranges of psi (bar) and GPM (L/M).

Vertical Turbine Fire Pumps

Patterson Vertical Turbine Fire Pumps employ the latest design concepts and engineering technology in producing highly efficient pumps for use in all safety applications.

They can be staged as necessary to meet desired requirements. Minimum

World Leader in Fire Control

floor space is required. Fire fighting application capacities are from 500 to 5,000 GPM (1,892 to 18,925 L/M), with pressures up to 350 psi (24 bar).

The Patterson Pre-Pac® Fire Pump

The Patterson Pre-Pac Fire Pump was created to provide quality fire control at less cost and in less space. Unlike conventional pumping systems, the Pre-Pac is self-contained so it saves money by reducing labor, engineering and installation time.

The real muscle of this prepackaged system is Patterson's reliable Split Case or Vertical Turbine pump, featuring discharge pressures of 40 to 390 psi (2.8 to 27 bar) and capacities of 150 to 5,000 GPM (565 to 18,925 L/M), plus all the necessary ranges of hydraulic performance that meet individual requirements and European standards.

Whether you select a completely housed Pre-Pac or a base mounted package, you can be assured that all sensing lines, fittings, piping, drive, pump and controls are designed to meet, or exceed, all applicable codes. For an added measure of security, the Pre-Pac is completely unit tested with all piping hydrostatically tested.

New Combination Saves Space, Time and Material

As a combination diesel engine/fire pump controller, the Patterson Engine Package (P.E.P.) greatly reduces the overall size and the complexity of usual engine and pump controller setups. Its smaller mounting base allows it to be used in "tight" pump rooms, where space is limited. And, its cost is lower since redundant components have been eliminated.

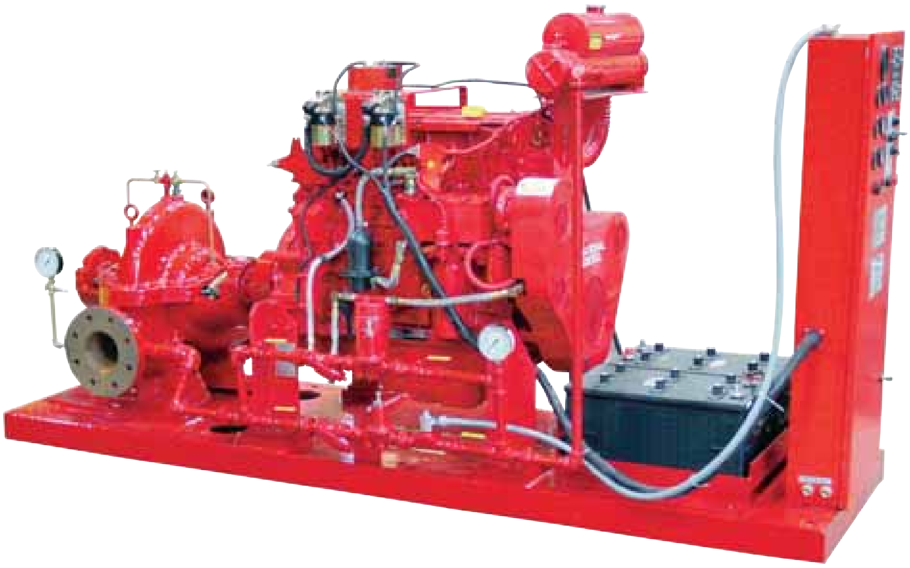
The integrated package also requires significantly less time and material for a contractor to install.

The P.E.P. unit is designed specifically for use with National Diesel Corp. engines, and the engine/controller assembly is UL listed and FM approved. High intensity LED displays for 15 separate functions provide ease of viewing, long life and reliability. The built-in system pressure gauge/transducer includes a battery backup to keep the recorder functioning in the event of control power failure.

Reliability of Patterson Pumps

Patterson's pump designing know-how, efficient production capability and careful attention to testing details ensure that each Patterson pump and prepackaged pumping system will perform its intended function efficiently, economically, reliably and durably.

Offering customers lower maintenance costs, less downtime, and prompt delivery of O.E.M. parts which are guaranteed to last longer, Patterson is the epitome of reliability as a fire pump manufacturer. This reliability is enhanced by coordinating training in proper operation and maintenance of its products at its training facility in Toccoa, Georgia.



Water and Wastewater Pumps and Systems

Patterson's full line of modern, high-performance pumps for water and wastewater dueies set the standard for the industry in both domestic and international markets.

Industries served by Patterson water and wastewater pumps include municipal, industrial, commercial, irrigation and flood control, and power generation.

Major markets include: agriculture, building industry, defense and other governmental agencies, electric power, export, marine industry, metal mining, miscellaneous markets, non-metallic mining, OEM industries, other manufacturing, paper industry, sewage systems, water supply, water treatment and water distribution.

Major water and wastewater products include industrial and commercial pumps; horizontal and vertical centrifugal pumps; non-clogging waste and sewage pumps; axial and mixed flow pumps for flood control and irrigation; multi-purpose vertical turbine pumps; municipal vertical turbine pumps; end suction pumps; general service pumps; and prepackaged pump systems.

Flo-Pak® Packaged Pumping Systems

Flo-Pak®, a business unit of Patterson Pump Company, located in Atlanta, Georgis, produces packaged pumping systems for the heating, ventilation and air conditioning (HVAC), plumbing, municipal and industrial markets.

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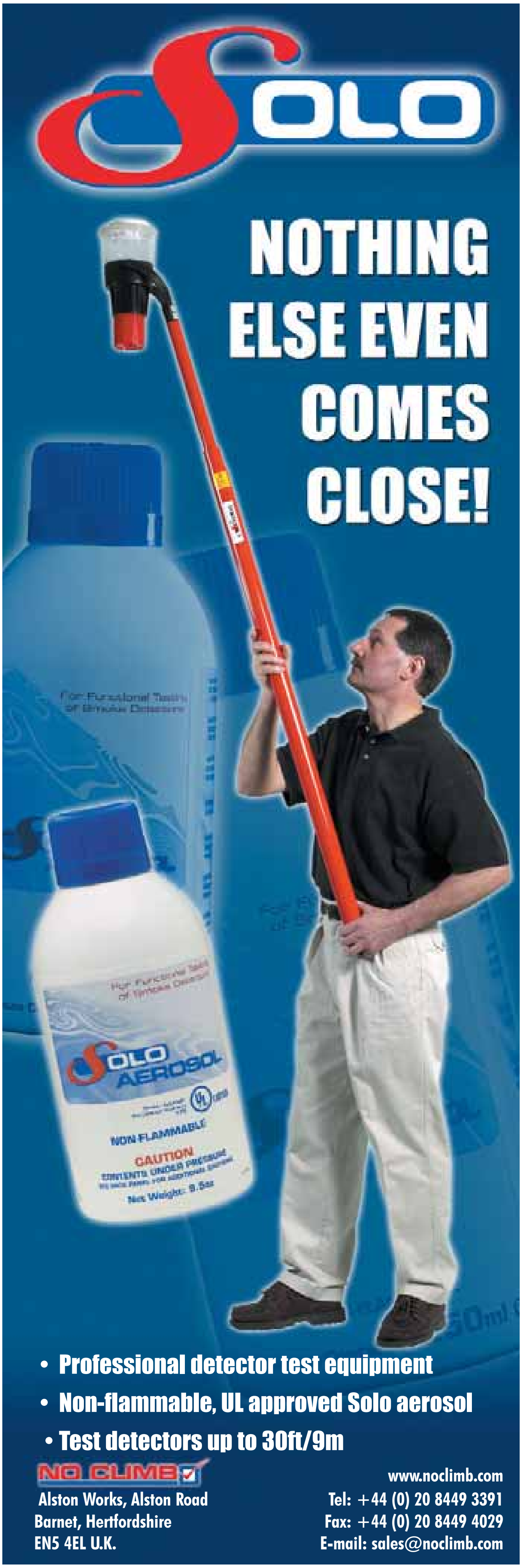

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Going Further with Risk Management

By Victoria Feltham of Serco Assurance

Fire risk assessment can be a very effective tool to combat the risk of fire in the workplace and demonstrate an equivalent level of safety in non-prescriptive building design. However used incorrectly or without proper consideration of risk management it could be worse than doing nothing at all.

Fire risk assessment is increasingly used in modern fire engineering. With the recent developments in the UK Fire Service, its use and benefits are being once again topic for discussion. Not only can it help save lives and prevent injuries, but also it can help save money.

The main, but not only, reason a fire risk assessment is carried out is to demonstrate that there is a tolerable level of risk. This demonstration is required either by the Fire Precautions (Workplace) Regulations (Amended) 1999, to provide a safe place to work, or as part of a risk-based fire engineered solution, which enables innovation of novel ideas and a departure from traditional prescriptive standards. Indeed, without fire risk assessment some of the greatest buildings would not have been well . . . so great.

The aim of fire risk assessment is to help employers realise their responsibilities, enable progress and innovation and, at the same time, identify unnecessary expenditure. So, how can risk management improve on such an effective system? Risk management is an integral part of good safety management. It enables resources to be targeted more effectively, it promotes the holistic understanding of buildings in the all-too-common culture of "sub-sub-contractor" and it increases the probability of recovery from a failure or emergency. Risk management asks the basic question WHAT HAPPENS IF?

- **What happens if a piece of safety related equipment fails?**
- **What happens if a fault occurs while a piece of equipment is out of order?**
- **What happens if our strategy depends on the designed operation of that equipment?**
- **What happens if the level of risk is increased?**

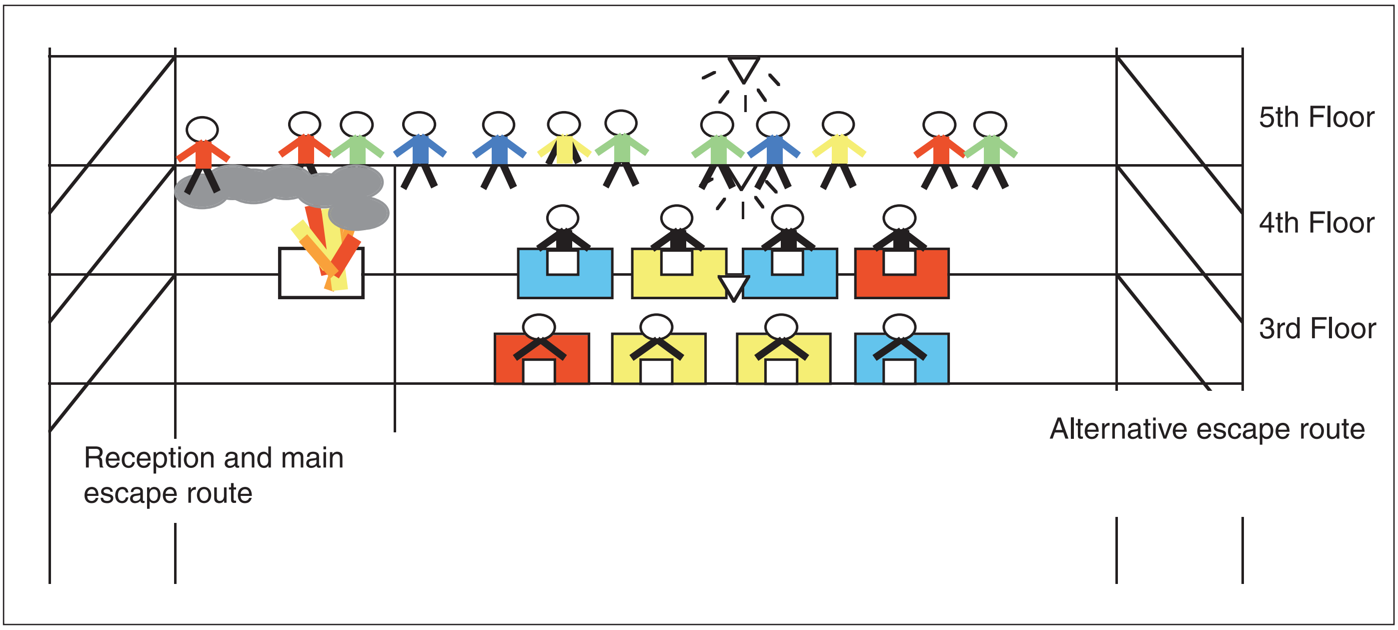
Risk management is a beyond compliance activity, which matches the allocation of resources to the level of risk. One objective of risk management is to enable compensation features to be put in place, so as to provide a level of equivalent safety when a failure occurs. The initial intention of risk management is to determine the consequences of a failure, such as a piece of safety-related equipment being out of action, or the inadvertent omission of a management requirement. Failure is further examined later in this article but, when the consequences are severe, or when there is a particular dependency on a system or procedure, risk management would identify possible scenarios, critical failures, remedial action and suitable methods of mitigating the revised level of risk until the original condition is regained. Risk management would also apply the same principles to an approved deviation from a fire risk assessment or strategy – for example, over Christmas when the population and fire load could be increased.

Two examples may be used to support the adoption of risk management. The first is a failure within a building in which a fire risk assessment has been performed as required in the Workplace Regulations. The second is when a fire occurs in a property where a risk-based fire engineered solution has been adopted.

Scenario 1: fire risk assessment

A recruitment consultancy takes let of the third and fourth floors of a ten-story office block (see figure). The level of risk is comparable to that of other office-based environments. The building is managed by a landlord's agent, who organises the tests for safety-related equipment and undertakes a fire risk assessment for communal areas. Independent contractors carry out the maintenance duties on the equipment. The remaining floors are occupied by other companies, which all have access

The initial intention of risk management is to determine the consequences of a failure, such as a piece of safety-related equipment being out of action, or the inadvertent omission of a management requirement.



Layout of office involved in scenario 1: fire risk assessment

to communal areas. As part of the tenancy agreement they have to undertake a fire risk assessment, which they do via a contractor. The contractor covers all aspects of fire safety, including equipment, training and passive protection. The fire risk assessment report is produced, concluding that requirements are met and that the risk is tolerable.

The drills are carried out as specified, the equipment is tested and the management ensure that the staff remain trained. Then, one day, a fire alarm sounder located in the lower office fails to operate during a routine test. No one in the affected office realises there is a fault and they continue as normal. The landlord's agent records the fault and calls an engineer, who will arrive later that day. An email is sent round the offices to let those affected know there's a problem and asking them to remain vigilant. However at the same time the company on the floor above is hosting an open day. Guests are milling around, increasing the occupancy and reducing the general awareness of the surroundings. At this point there are two variations in the level of risk as detailed in the fire risk assessment.

What if a fire were to occur now?

The photocopier in the reception overheats and ignites a small amount of paper nearby, resulting in a small but developing fire. The fire activates the detectors and the alarm is raised. Everyone who hears the sounder makes for the escape routes, but the evacuation time is increased due to the increased population from the company above and the need to locate an alternative escape route because of the location of the fire. Meanwhile, people in the office area downstairs are starting to realise that something may be wrong, but they are confused, because there is no alarm and the expected escape route is not being used. This delays the response and evacuation, which increases the risk these people face.

Prior risk management would have played an important role in this scenario. The automatic fire detection system (AFD) compensates for a risk. With that out of order, what provides an equivalent level of safety?

No one asked "what happens if . . . ". The building's safety is demonstrated by the fire risk assessment with the tenant's fire risk assessment only being one part. With this segmented approach, one is unable to understand the knock-on effects and manage the risk effectively without considering the full picture. The failure of the AFD system is a single-point failure, because the back-up "system" (the downstairs staff noticing the people evacuating pass the reception) was not present. These issues may not have been picked up on the fire risk assessment mainly due the lack of a holistic approach. Scenario 1 uses a failed AFD system as an example, but it could equally be any other safety-related piece of equipment or management requirement.

As part of the tenancy agreement they have to undertake a fire risk assessment, which they do via a contractor. The contractor covers all aspects of fire safety, including equipment, training and passive protection.

Scenario 2: A risk based fire engineered solution

An owner of a historically important country house wants to open it the public and convert an area into a café and gift shop. The design process identifies that the risk of fire is elevated with the addition of the facilities. Life safety issues have been addressed but there was still a concern about possible property damage. Therefore, the required level of fire resistant construction is installed but, as one of the owners' requirements was to have the area open and free-flowing, the fire door between the café and house is

kept open by automatic fire closers linked to the AFD system. The door closure mechanisms are tested periodically as part of the overall safety maintenance programme. Unfortunately, there is a fire in the café area, the AFD system activates, and people evacuate safely but the doors fail to close. The consequences of smoke or heat damage to the property and business could be very severe and something the new businesses may not be able to take on.

With this example there is also a single-point failure. This issue could have been picked up at the design stage and a management contingency plan could have been developed.

Summarising the above, we have consider the two scenarios, distinctly different but both fail to ask the question "What happens if . . . "?

Asking and evaluating the "what happens if . . . " is what risk management is all about. Risk management is taking responsibility for one's assumptions throughout the entire life of the building, and adapting to changes.

Scenario 1: fire risk assessment

In the first example, effective risk management would encompass the understanding of the consequences and the actions required when a piece of safety related equipment fails. It would raise questions such as:

- Who is responsible for safety while there is a fault?
- What is the status of the building, and are there any actions being undertaken which increase the risk further?
- How is information circulated?
- Can the function of the failed item be performed in another way in the meantime?
- How long can a failure be tolerated before the events deteriorate?
- What happens if something else goes wrong, and what actions are needed?

With the increasing popularity of contracting out maintenance and testing duties for safety-related equipment, there can be a tendency to dissipate responsibility. As each contractor is not responsible for communicating with the other contractors, the building is seen less as a whole but more as collection of single issues. Consequently, understanding of how the building operates holistically is reduced and the probability of overlooking a knock-on issue is increased. In this situation, many landlord agents and tenants do not know how the building operates, why equipment is installed and indeed, most significantly, understanding the process of recovery and mitigation when something fails. A prominent feature of failure is that it is hardly ever analysed in sufficient detail, so what normally happens is failure by stealth. A critical failure is never a single event. The last failure, which may seem to be the main cause of the emergency, is never independent and is always linked to other issues. Therefore failure is described as progressive: a single failure hardly ever leads to serious consequences – it is the culmination of a number of smaller faults and failures which have such serious consequences. Correspondingly, when there is a lack of understanding about failure, the ability to effectively mitigate the situation before the consequences deteriorate is reduced. Once a risk management approach is adopted, an understanding of the progression of failure is developed and there is then scope to mitigate and manage the situation.

Scenario 2: A risk based fire engineered solution

This highlights the considerations associated with dependence and reliability. As discussed, the increase in risk from the development of the café and gift shop was balanced by fire resistant construction with fire doors held open by automatic fire door closures. This design approach resulted in a weak link: effectively the design is dependent on the reliability of automatic fire door closers: this is a single-point failure. Therefore, risk management is indispensable. Risk management will assess and evaluate the likelihood of success. Risk management will examine the dependency on one piece of equipment, and ask the questions: What happens if it fails? Is there anything else provided to offer some protection? How reliable is the piece of equipment and can it be improved and, as a result, does the maintenance schedule need to be reviewed?

This example identifies the necessity for adopting risk management rather than purely demonstrating compliance. If a calculated level of risk is used to strengthen a strategy or action as an alternative to prescriptive standards, risk management should be used to verify that the design will meet the requirements; and if it fails, to identify the procedure of mitigation and recovery. Risk management also identifies when extra protection is not needed. If an understanding of the importance of safety-related equipment is established, resources can be assigned to them accordingly.

There a number of benefits to gain by adopting a risk management approach:

- It identifies areas of opportunity for mitigating potential losses and targeting resources. Examining failure, and asking "what happens if . . . ", identifies the correct remedial action and procedures to mitigate consequences and limit damage to life, property and business continuity.
- It demonstrates the validity of a risk-based fire engineered solution. When a strategy depends on a system functioning correctly, risk management can be used to demonstrate its reliability, thus substantiating the solution.
- It provides a holistic understanding of how a building operates. Tenants or contractors can be provided with equipment and management procedures, of which the importance is not understood. Risk management can provide information that can be used to assign importance to critical equipment and management procedures, compared to a traditional approach.
- It demonstrates accurately the total risk associated with a building to insurance companies. Through a risk-management approach, the low risk of loss can be demonstrated and managed, and this may result in halting growing premiums or even reduce them.

By adopting a risk management approach, scope is provided to demonstrate compliance and add validity to any engineered solution. Mistakes will happen and failures do occur. Facility managers and designers should be more prepared to accept these facts of life and use risk management to deal with them successfully.

Communication Center Fire Protection

By Ralph E. Transue, P.E.
Rolf Jensen & Associates, Inc.
The RJA Group, Inc., Chicago, IL, USA
Chair, NFPA International, Technical Committee on Telecommunications

COMMUNICATION CENTERS take many forms. Common characteristics include great reliance on electronic equipment and few people. People present are not the general public. They are people with knowledge and purpose, familiar with the center and its mission.

MISSION

Missions of communications centers include telecommunications, public safety communications, process control, data transfer, financial transactions, dispatching, broadcasting, security monitoring, asset protection, satellite links, transmission of military and business information, and monitoring of campuses, military bases and building complexes.

Mission continuity in such facilities requires protection against the threat of fire.

BEST PRACTICES

Telecommunications facilities throughout the world benefit from the best facilities and practices that the local economy can support. Societies recognize the importance of communications for personal, civil, business, and military effectiveness. Governments or service providers apply practices including conforming to building codes and fire prevention regulations, good house keeping, limiting storage of combustibles, fire resistive construction, secure facilities, compartmentalizing buildings and providing redundancy in network facilities. These practices have resulted in an outstanding fire loss record in hundreds of thousands of square meters of communication center floor space worldwide over many years, despite several high profile exceptions in the latter half of the twentieth century. One effort to capture best practices used in North America has been the publication of NFPA 76 – Recommended Practice for the Fire Protection of Telecommunications Facilities, intended to provide a reasonable level of network protection and safety to life from the threat of fire. It is a performance-based document and also includes prescriptive recommendations as alternatives to the performance-based approach. Developed using a consensus method by a balanced committee of experts from the U.S. and Canada, the committee is currently improving the recommended practice document further to be proposed for adoption as a standard.

FIRE & SMOKE

Fire threat to electronic equipment can originate in the equipment itself or external to the equipment. Fire history shows that communication center and electronic data processing fire damage have resulted from electrical power circuits, electronic equipment, normal combustibles and house keeping causes, and as a result of exposure from fire in other facilities.

Fires threaten people in the building, the mission of the facility and property.

Smoke, corrosive products of combustion, threatens the operability and repair ability of electronic equipment even as it may threaten human life. The early stage of fire development is likely to produce smoke, especially when electronic equipment or cable insulation is involved.

Early warning smoke detection methods can alert people to the need to investigate the source. Intervention to reduce or eliminate the threat to people and the mission of the facility is the first goal. That intervention may occur at a point of component overload or very small fire involving normal combustibles, prior to any threat beyond the point of origin, using very early warning smoke detection systems.

Successful human intervention requires effective processing of the alert signal and timely response by one or more knowledgeable person. Terminating the incident by extinguishing a small fire, removing an overloaded circuit board or removing power to a circuit or equipment frame may occur before any automatic fire suppression system would release its agent.

In some cases, a means to extract or manage smoke is recommended to prevent corrosive damage to equipment not otherwise affected by the fire. The mission of the facility is dependent upon the prevention of corrosive smoke and water damage to electronic equipment.

FIRE RESISTANT EQUIPMENT

After some large loss fires affected the U.S. telecommunications network in the 1960s and 1970s, the industry developed standards that include requirements to limit fire growth in equipment, wire and cable used within telecommunications facilities. Equipment procurement specifications for most of the telecommunications equipment and cable installed in U.S. and Canadian telecommunications facilities require conformance to the fire resistance standards. This practice has been successful in limiting the size of equipment fires that have occurred since.

The same cannot be said for data

Pic courtesy of RJA Group

processing and information technology equipment used for more general purposes that does not meet the requirements of the fire resistance standards. Nor would it apply to telecommunications equipment and cable designed and manufactured to other standards.

Methods used in the design and manufacture of equipment and cables to conform to the standards result in greater production of smoke but lesser and slower fire spread in the event of a fire. This North American approach has resulted in an excellent record of preventing electronic equipment malfunctions from becoming major fires. Combined with the excellent fire service response throughout most populated areas in the U.S. and Canada, this fire resistance approach lessens the need for automatic fire suppression in telecommunications equipment spaces.

Fire protection for equipment and facilities that do not include the equipment and cable fire resistance is more challenging. A performance-based analysis is recommended.

FIRE THREAT ASSESSMENT

Fire threat assessments of facilities can identify the levels of conformance with good fire prevention practices, fire separations, equipment and cable standards, and the types of threats or hazards present in or adjacent to the facility.

Threat assessments for communication centers should be performed on a space-by-space basis. Larger facilities are separated into spaces that conform to functional uses of the spaces. Each type of space presents hazards or characteristics associated with the use and contents of the space. It is not recommended that communications centers be treated as a single occupancy. For fire protection, the characteristics of spaces vary greatly, not only in contents but also in the level of criticality to the mission of the facility.

Once having become familiar with the communications center and the characteristics of its spaces, it is advisable to understand the mission of the facility and the level of importance or criticality of the spaces to accomplishing the mission. Lacking the information on relative importance, it may be necessary to treat the entire facility as critical to the mission. Alternatively, it may be acceptable to treat electronic equipment and power spaces as more critical to the communication mission than administrative and support spaces.

Wherever a critical functional use of equipment occupies the same space as a less critical functional use, the space must be treated at the higher level of criticality.

SOLUTIONS

No single solution is best for every configuration of communication center.

Communication centers may be grouped into types that have common characteristics and by sizes, but it is the services provided by the center and the customers served by the center that determine the criticality of the facility.

Methods of protection and levels of performance that are necessary for continuity of service against fire should be determined by the center's mission and customers served, more so than its physical characteristics. Stakeholders must decide what performance levels are required for network protection. Designers and installers must achieve and verify that performance using passive and active fire protection systems. Facility operators must maintain the fire protection systems for the life of the center to protect network operations and provide safety to life and property.

INTEGRATED FIRE PROTECTION SYSTEMS RESPONSE

Passive and active fire protection systems work together to achieve required performance.

Passive Systems

- Begin with risk reduction. Owners and operators should apply resources to achieve lesser frequency and severity of fire incidents.
- Progress to rigorous fire prevention practices. Comply with regulations. Control hazards.
- Comply with building codes. Use fire resistive construction. Use containment and maintain compartment integrity.
- Create awareness. Inform occupants and responders.
- Secure the center against unauthorized entry and external threats.
- Plan, document and train for emergency response.

Active Systems

Fire Detection

In the most critical functional areas, the optimum first choice where responders are available and trained, is the combination of:

- Very early warning fire detection alert and alarm.
- Rigorous alert and alarm processing.
- Rapid response by trained people.

The goal is to terminate the incident before it becomes a growing fire.

Some losses have occurred where the detection system performed properly, but failure occurred in processing the signal to responders or the responders were not positioned to respond quickly.

AUTOMATIC SUPPRESSION

Automatic suppression systems should be used with care. Used where fire resistive equipment or construction is not present or is not adequate. Used where adequate alarm processing and rapid response cannot be achieved. Used with care because risk of damage, downtime and cleanup accompanies the discharge of any fire suppression agent on energized electronic equipment.

It is understood that fire suppression agents that are corrosive must not be used on electronic equipment.

Considering the use of automatic fire sprinkler systems and clean agent systems, a summary guide is as follows:

- Automatic sprinkler systems are best suited to protection of
  - the structure.
  - storage spaces.
  - cable entrance spaces.
  - non-equipment spaces.
- Clean agent systems are best suited to protection of electronic equipment spaces.

The discharge of water in the presence of electronic equipment can be destructive to the equipment. More so when the equipment is energize.

A fire must be very active to produce the significant temperature rise necessary for actuation of automatic fire sprinklers. In the presence of electronic component failures or small fires that may occur in equipment spaces, automatic sprinkler systems do not activate. If an equipment space fire should grow to a heat release rate great enough to activate the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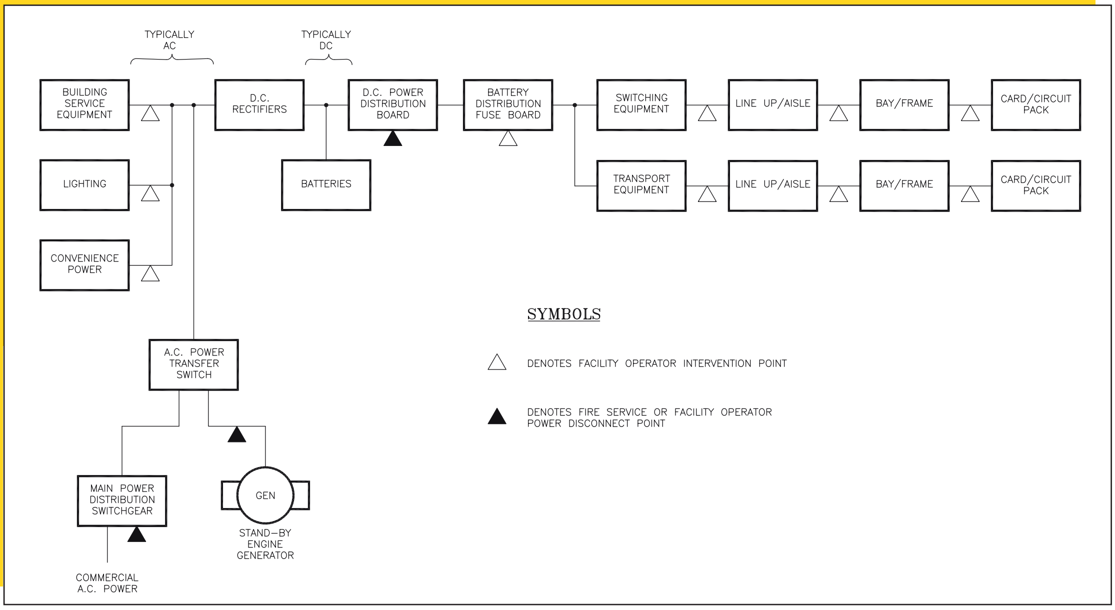

sprinkler system, products of combustion would combine with water spray and elevated humidity to produce corrosive acids which will attack the connections in the electronic equipment. By that time, severe equipment damage will occur.

SMOKE MANAGEMENT

An alternative approach to automatic suppression, to protect the equipment against smoke damage early in a fire incident, is smoke extraction or management. That is not a statement that smoke management is equivalent to fire suppression – it is not.

Where equipment spaces are very large or very critical, and the performance required of the active and passive systems is to protect equipment from smoke in the equipment space, smoke management can perform up to limits. A system to remove smoke high in the space with make-up air introduced low in the space can keep the corrosive products of combustion above equipment that is not directly exposed to the fire. Such systems must be carefully designed and maintained.

This approach must be combined with rapid fire service response. The clear air introduced into the space aids fire service response. Fire service operations must be such that suppression is swift and involves minimal area of attack to avoid equipment damage. Studies have shown this method with well-informed fire service and communications center staff provides greater service continuity than the automatic sprinkler system solution.

The limitation to the smoke management solution in lieu of the automatic sprinkler solution is that a growing fire will eventually produce more energy than the smoke management system can handle. By that time, severe equipment damage will occur.

It is the partnership between the fire service and communications center staff for early detection, rigorous alarm processing, activation of smoke extraction systems and rapid response that makes the smoke management approach successful.

POWER DISCONNECT

One method of intervention for electrical fires or overloads of any size is to disconnect power – sometimes described as powering-down or de-powering. The committee that is continuing the development of NFPA 76 plans to include de-powering requirements or recommendations in the 2005 edition.

It is not unusual for the fire service to request or cause disconnect of power to any building involved in fire attack.

Communications centers are unique in that de-powering the facility

- Is difficult due to several levels of power redundancy.
- Interrupts services provided by the facility.
- Causes critical missions to fail.

For communication center electrical overloads or fires, the optimum de-powering approach is to remove power from the smallest segment of the power distribution system that is necessary to de-energize the equipment or cable involved in the fire. This requires knowledge of the power system and is best done by communications center trained staff. Alternatively, a program of familiarization between the center operator and the fire service may provide the fire service with sufficient knowledge to perform some of the power disconnecting functions even without the operator's personnel. Figure 1 illustrates points in the power distribution system where facility operators and fire service can disconnect power in a communication center, based on the traditional North American central office power arrangement.

Selective de-powering requires marking the operating equipment and the power disconnecting means associated with the operating equipment. A means to direct the fire service to the location of the disconnecting means may also be necessary.

EXPOSURE

Electronic equipment spaces and the building systems and facilities that support the operating equipment can be damaged by exposure to external fire threats. Such threats may be from other spaces within the communication center or from property owned and operated by others.

Protection against such exposure requires adequate separation and fire suppression for the non-communication center space to prevent the spread of fire and smoke into the communication center.

If a communication center is to be located in a multiple tenant building, the building selected should be of fire resistive construction with an automatic suppression system throughout the non-communication center space.

In rural and suburban areas, plantings and natural growth should be cleared away from the communication center. Air intake openings should be located high and away from outside sources of smoke or other contaminants.

SPECTRUM OF SOLUTIONS

Much information is available from suppliers of passive and active products and systems. Each has a potential place in protecting the mission of communication centers; continuity of service.

To maximize continuity of critical communication services against the threat of fire

- Assess and minimize the risks.
- Determine protection performance levels required.
- Match cost-effective, integrated passive and active systems to performance goals.
- Maintain long-term performance of systems.
- Plan, document, and practice.

For references see:

"Fire Protection of Telecommunications Facilities," *Fire Protection Handbook,* 19th ed., vol.2, ed. Arthur E. Cote (Quincy, Mass.: National Fire Protection Association, Inc., 2003), 267-277.

Mr. Ralph E. Transue is a Senior Vice President with The RJA Group, Inc. Located in the company's global headquarters in Chicago, IL USA, Mr. Transue has extensive experience in designing fire protection systems for communication centers. He currently serves as Chair for NFPA International's Technical Committee on Telecommunications. To learn more about The RJA Group visit their website at www.rjagroup.com.

Sprinkler Design Consid Storage in a Ma

Warehouse storage

By Jonathan M. Eisenberg, P.E.,
Consulting Engineer
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MANUFACTURING PLANTS FREQUENTLY incorporate warehouse storage into their facility designs. The types of materials stored, the storage configurations, and storage conditions all impact the sprinkler design considerations for the warehouse areas. This article presents a case study of a recent warehouse sprinkler design for a large manufacturing plant. The fire protection design work included research and specification of sprinkler design criteria for ambient and cold storage areas; rack storage; and storage of hazardous materials.

APPLICABLE CODES AND STANDARDS

The sprinkler design work was based on the following nationally recognized codes and standards:

- NFPA 13, *Standard for the Installation of Sprinkler Systems* (2002 Edition)
- NFPA 30, *Flammable and Combustible Liquids Code* (2000 Edition)

It should be noted that beginning with the 1999 Edition, NFPA 13 incorporated the sprinkler design criteria for storage of various types of Commodities, which were previously covered by standards such as NFPA 231C, *Standard for Rack Storage of Materials.*

TYPES OF MATERIALS, STORAGE CONFIGURATIONS, AND CONDITIONS

The main warehouse, a large area of the manufacturing plant, contained three (3)-tier high rack storage of operating supplies (including plastic sample bottles in cardboard cartons) and relatively small containers (ten (10) gal) of flammable liquids. The main warehouse area was maintained at ambient temperature.

A room adjacent to the main warehouse was used for storage of hazardous materials, including 100% ethanol in 55-gallon drums on racks, two (2)-pallets high.

A cold room (with a –80°C freezer) was used for storage of process materials, which were not flammable or combustible. There was no rack storage in this area (materials were stored on shelves).

Several additional cold rooms (2-8°C) were used for storage of 18% ethanol/water solutions in 55-gallon plastic drums, on open-grate racks, three (3)-pallets high.

MAIN WAREHOUSE AREA

For storage of operating supplies, such as empty sample containers in cardboard boxes, several questions should be answered before selecting the sprinkler design criteria:

1. What is the maximum storage height?
2. What is the maximum ceiling height?
3. What is the commodity class, according to NFPA 13, 5.6.3?
4. Is the stored material encapsulated?
5. What is the rack configuration and rack aisle width?
6. Are in-rack sprinklers mandated by local ordinances or insurance requirements?

NFPA 13, 5.6.3 defines commodities into four (4) classes:

- **Class I** – Noncombustible product placed directly on wooden pallets; or placed in single layer corrugated cartons; or shrink wrapped or paper wrapped as a unit load. Examples of Class I commodities are: noncombustible liquids in plastic containers less than 5 gallons in size, and empty glass jars in cartons.
- **Class II** – Noncombustible product in slatted wooden crates, solid wood boxes, multi-layered corrugated cartons, or equivalent combustible packaging material. Examples of Class II commodities are: noncombustible liquids in plastic containers greater than 5 gallons in size, and nonflammable liquids in glass bottles, in cartons.
- **Class III** – product fashioned from wood, paper, natural fibers, or Group C plastics, with or without cartons, boxes, or crates, and with or without pallets. Class III commodities can contain up to five (5) percent of Group A (eg. Polystyrene, Polyethylene) or Group B (eg. Nylon, Silicon) Plastics. Group C plastics include materials such as Melamine and Phenolics.

  Examples of Class III commodities are: paper products, rolled paper, and bagged PVC resin.
- **Class IV** – Product that is constructed partially or totally of Group B plastics; or consists of free-flowing Group

erations for Warehouse nufacturing Plant

A plastics; or contains within itself or within its packaging, 5-15% (weight) or 5-25% (volume) of Group A plastics. Examples of Class IV commodities are: empty PET bottles in cartons, and bagged PVA resin.

In this case, the maximum storage height is 20 feet; the maximum ceiling height is 30 feet; the commodity class is Class III; the stored material is not encapsulated; the rack aisle width is eight (8) feet; and in-rack sprinklers are not required.

The sprinkler design criteria for this area of the facility were specified from NFPA 13, Table 12.3.2.1.2 (overleaf) and Figure 12.3.2.1.2 (c):

- Design Density – 0.37 gpm/sq.ft.
- Design Area – 2,000 sq.ft.
- Sprinkler Spacing – 100 sq.ft.
- Maximum Distance Between Sprinklers – 12 ft (NFPA 13, Table 8.6.2.2.1 (c))
- Inside/outside Hose Stream – 500 gpm
- Sprinkler Temperature Rating – 286°F
- No in-rack sprinklers

Several rows of rack storage in the main warehouse contained ethanol. Due to the special hazards associated with flammable liquid storage, these rows were treated differently from the other rows in the warehouse. NFPA 30, Section 4.8 provides sprinkler design criteria for rack and bulk storage of flammable and combustible liquids. The NFPA 30 criteria are based on large-scale fire tests, which are described in the Appendix to the code.

Several questions to be asked for the ethanol storage area are:

1. What is the classification (IA, IB, IC, II, IIIA) of the liquid being stored?
2. Is the liquid water-miscible and is its concentration in water >50%?
3. Are the containers non-relieving or relieving-style?
4. What is the container material of construction (metal, plastic, glass)?
5. Are the liquids being stored in racks, or in bulk or palletized form?
6. What is the fire suppression agent of choice (water, foam-water)?
7. What is the maximum storage height?
8. What is the maximum ceiling height?

Ethanol is a Class IB flammable liquid, as defined by NFPA 30,1.7.3.2 and is water-miscible, but has a concentration >50%. For this storage area, the ethanol was contained in metal, ten (10)-gallon relieving-style containers. The containers are on open-grate racks (maximum height of 25 feet; maximum ceiling height of 30 feet), protected by a wet sprinkler system. The sprinkler design criteria for this section of the main warehouse were specified from NFPA 30, Table 4.8.2 (a):

- Design Density – 0.60 gpm/sq.ft.
- Design Area – Covering the rows containing Class IB flammable liquids, plus a ten (10)-foot perimeter outside of these rows

Table 12.3.2.1.2 Single- or Double-Row Racks - Storage Height Up to and Including 25 ft (7.6 m) Without Solid Shelves

Height	Commodity Class	Encapsulated	Aisles ft	Aisles m	Sprinklers Mandatory In-Rack	Ceiling Sprinkler Water Demand – With In-Rack Sprinklers: Figure	Curves	Apply Figure 12.3.2.1.5.1	Without In-Rack Sprinklers: Figure	Curves	Apply Figure 12.3.2.1.5.1
Over 12 ft (3.7 m) up to and including 20 ft (6.1m)	I	No	4	1.2	No	12.3.2.1.2(a)	C and D	Yes	12.3.1.2(a)	G and H	Yes
			8	2.4			A and B			E and F	
		Yes	4	1.2	No	12.3.2.1.2(e)	C and D		12.3.2.1.2(e)	G and H	Yes
			8	2.4			A and B			E and F	
	II	No	4	1.2	No	12.3.2.1.2(b)	C and D		12.3.2.1.2(b)	G and H	Yes
			8	2.4			A and B			E and F	
		Yes	4	1.2	No	12.3.2.1.2(e)	C and D		12.3.2.1.2(e)	G and H	Yes
			8	2.4			A and B			E and F	
	III	No	4	1.2	No	12.3.2.1.2(c)	C and D		12.3.2.1.2(c)	G and H	Yes
			8	2.4			A and B			E and F	
		Yes	4	1.2	1 Level	12.3.2.1.2(f)	C and D				
			8	2.4			A and B				
	IV	No	4	1.2	No	12.3.2.1.2(d)	C and D		12.3.2.1.2(d)	G and H	Yes
			8	2.4			A and B			E and F	
		Yes	4	1.2	1 Level	12.3.2.1.2(g)	C and D				
			8	2.4			A and B				

(Reproduced In-part from NFPA 13 2002 Edition)

Note: The sprinkler design density is read off the appropriate figure and curves.

- Sprinkler Spacing – 100 sq.ft.
- Maximum Distance Between Sprinklers – 12 ft
- Inside/Outside Hose Stream – 500 gpm
- Ceiling Sprinkler Temperature Rating – 286°F
- K = 8.0 or 11.2
- Standard or quick-response sprinklers

In-rack sprinkler protection for the ethanol storage was also specified from NFPA 30, Table 4.8.2 (a):

- One (1) line every other level, beginning above the 1st storage level
- Spacing – nine (9) feet on centers, staggered vertically
- 30 gpm per head, with eight (8) hydraulically most remote heads operating in the 2nd level
- K = 5.6 or 8.0
- Quick-response sprinklers, with shields
- Sprinkler temperature rating –165°F

HAZARDOUS MATERIALS STORAGE ROOM

A four (4)-hour fire resistance rated room was set up to house hazardous materials storage in two (2)-tier racks, including 100% ethanol in 55 gallon, metal non-relieving style drums.

Following the same approach used for the ethanol rack storage area in the main warehouse, the design was for Class IB flammable liquid, with a concentration >50%. The containers are on open-grate racks (maximum height of 25 feet; maximum ceiling height of 30 feet), protected by a wet sprinkler system. The sprinkler design criteria for this section of the main warehouse were specified from NFPA 30, Table 4.8.2 (a):

Table 4.8.2(a) Water Sprinkler Protection of Single or Double Row Rack Metal Containers (for Nonmiscible Liquids or Miscible Liquids with Flammable Liquid Concentration >50%)

Relieving-StyleContainers[d]										
Liquid Class	Container Size and Arrangement (gal)	Maximum Storage Height (ft)	Maximum Ceiling Height (ft)	Ceiling Sprinkler Type: Nominal K-Factor	Response[a]	Density (gpm/ft²)	Design Area (ft²)[b]	In-Rack Sprinkler Protection	Notes	Fire Test Ref.
IB, IC, II, or IIIA	<= 5	14	18	11.2	QR	0.65	2000	None	1, 3	7
	<= 5	25	30	5.6 or 8.0	SR or QR	0.30	3000	One line every other level, beginning above first storage level	2, 7	8
IIIB	<= 5	40	50	5.6 or 8.0	SR or QR	0.30	2000	One line every other level, beginning above first storage level	2, 6	9

(Reproduced In-part from NFPA 30 2000 Edition)

1. Double-row racks 6 ft wide maximum.
2. Space in-rack sprinklers on maximum 9-ft centers, staggered vertically. Base design on 30 gpm per sprinkler, with six hydraulically most remote sprinklers operating in each of the upper three levels, or eight hydraulically most remote sprinklers if only one level. In-rack sprinklers are K=5.6 or K=8.0, QR, ordinary temperature with shields.
3. Use pendent-style K=11.2 ceiling sprinklers.
4. Space in-rack sprinklers on maximum 9-ft centers staggered vertically, 30 gpm per sprinkler, K=5.6 or K=8.0, QR or SR, with shield, or ordinary temperature, six hydraulically most remote sprinklers each level (upper three levels) operating. Eight sprinklers operating, if only one level.
5. Protection for uncartoned or case-cut nonsolid shelf display up to 6 1/2 ft and storage above in pallets on racking, shelf material, open wire mesh, or 2 in x 6 in wooden slats, spaced a minimum of 2 in apart.
6. A 0.60 density shall be used if more than one level of storage exists above the top level of in-rack sprinklers (K=8.0 or 11.2 for ceiling sprinklers).
7. A 0.60 density/2000 ft² shall be used if more than one level of storage exists above the top level of in-rack sprinklers (K=8.0 or 11.2 for ceiling sprinklers).

a SR = standard response and QR = quick response, where both are listed.
b Ceiling sprinkles high temperature.
c See NFPA 30 Table D.2(a) for references to fire tests on which the protection criteria in this table are based.
d Both 3/4 in. (20 mm) and 2 in. (50 mm) listed and labeled pressure-relieving mechanisms are required on containers greater than 6 gal capacity.

- Design Density – 0.40 gpm/sq.ft.
- Design Area – Entire room (since the room is smaller than the 3,000 square foot NFPA 30 requirement)
- Sprinkler Spacing – 100 sq.ft.
- Maximum Distance Between Sprinklers – 12 ft
- Inside/Outside Hose Stream – 500 gpm
- Ceiling Sprinkler Temperature Rating – 286°F
- K = 8.0 or 11.2
- Standard-response sprinklers

In-rack sprinkler protection for this room was identical to the ethanol storage area in the main warehouse except that in-rack protection was provided on each of the two (2) levels and 165°F, large-orifice sprinklers were used.

Special consideration was given to containment and drainage of the sprinkler discharge in this room, since the flammable liquid container size exceeded ten (10) gallons (NFPA 30, 4.4.2.5). The criteria used to determine the required volume of containment was taken from NFPA 15, *Standard for the Installation of Water Spray Fixed Systems*:

0.4 gpm/sq.ft. x area of room (sq.ft.) x 20 minutes of discharge

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Approval	Bldg. Height*	K-25 Pressure	K-25 Flow	K-22 Pressure	K-22 Flow	K-22 System Savings
cULus	45' (13,7m)	40 psi (2,8 bar)	160 gpm (605 L/min)	40 psi (2,8 bar)	142 gpm (537 L/min)	216+ GPM (817+ L/min)
FM	45' (13,7m)	50 psi (3,4 bar)	178 gpm (673 L/min)	50psi (3,4 bar)	158 gpm (597 L/min)	240+ GPM (908+ L/min)

* with up to 40ft. (12,2m) storage

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Since the required containment volume was on the order of several thousand gallons, curbing or a depressed slab were not a practical solution for this room. Therefore, trench drains were installed and piped to a central waste collection tank in the facility. (As an alternative, a non-water-based fire suppression system (eg. FM-200) could have been used in this room. In that case, only the volume of the largest container would need to be contained).

COLD STORAGE ROOMS

Another room immediately adjacent to the main warehouse was maintained at approximately 2-8°C and housed a –80°C freezer. No flammable or combustible materials were stored in the room. Sprinkler protection was provided within the 2-8°C conditioned space. Based on NFPA 13 requirements, wet pipe sprinklers are not permitted in environments subject to temperatures below 40°F. Therefore, dry pendant sprinklers, piped off the warehouse wet pipe system, were used for this application.

The cold storage room was classified as Ordinary Hazard Group 2, consistent with the classification used for similar spaces elsewhere in the facility. Using NFPA 13, Figure 11.2.3.1.5, the sprinkler design criteria were:

- Design Density – 0.20 gpm/sq.ft.
- Design Area – 2,000 sq.ft.
- Dry pendant sprinklers
- Sprinkler spacing – 130 sq.ft.
- Maximum Distance Between Sprinklers – 15 feet
- Inside/Outside Hose Stream – 250 gpm
- Sprinkler Temperature Rating – 165°F

Several additional cold storage rooms, each maintained at 2-8°C, housed 18% ethanol/water solutions in plastic drums on three (3)-tier racks. An 18% ethanol/water solution in a plastic drum is considered a Class III commodity according to the NFPA 13 definition. Therefore, sprinkler design criteria identical to those for the main warehouse were specified for these 2-8°C cold rooms (using NFPA 13, Table 12.3.2.1.2 and Figure 12.3.2.1.2 (c)):

- Design Density – 0.37 gpm/sq.ft.
- Design Area – 2,000 sq.ft.
- Sprinkler Spacing – 100 sq.ft.
- Maximum Distance Between Sprinklers – 12 ft (NFPA 13, Table 8.6.2.2.1 (c))
- Inside/outside Hose Stream – 500 gpm
- Sprinkler Temperature Rating – 286°F
- No in-rack sprinklers

SUMMARY

Sprinkler design for warehouse storage applications should start by asking questions on several aspects, such as:

- Type of material stored – flammable or combustible; plastic; type of NFPA 13 commodity; encapsulation; cartons; container size
- Storage configuration – rack storage; storage height; aisle width; palletized or bulk storage
- Storage conditions – ambient temperature; below 40°F conditions

Once these questions are answered, the design can proceed, using codes and standards such as NFPA 13 and NFPA 30.

In the case study presented here, sprinkler design densities ranged widely, from 0.2 gpm/sq.ft for ordinary hazard areas, up to 0.6 gpm/sq.ft. for extra hazard areas, such as rack storage of flammable liquids. The background information for these determinations came from discussions with plant engineering, operations and facilities personnel. After the research was completed and the sprinkler design criteria determined, all assumptions were documented and confirmed with the facility management.

Mr. Jonathan Eisenberg, P.E. is a consulting engineer with the fire protection firm Rolf Jensen & Associates, Inc. (RJA). Located in the Boston, MA office for RJA, Mr. Eisenberg has designed fire protection systems for a myriad of unique facilities including warehouses, hazardous materials storage, clean rooms, and laboratories.

What do the numbers and symbols on an NFPA fire diamond mean? The diamond is broken into four sections. Numbers in the three colored sections range from 0 (least severe hazard) to 4 (most severe hazard). The fourth (white) section is left blank and is used only to denote special fire fighting measures/hazards.

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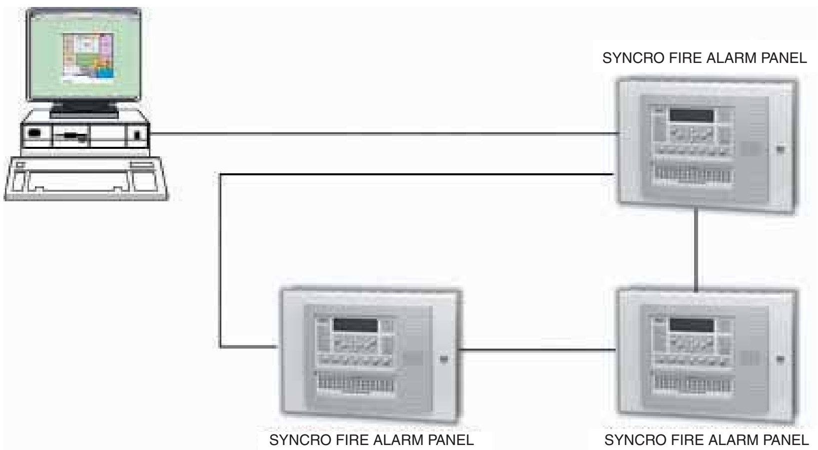

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Water mist for deep fat fryers

By Stefan Kratzmeir (Dipl.-Ing.)
FOGTEC Brandschutz GmbH & Co. KG

AN OPTIMAL SOLUTION

A HUGE AMOUNT OF INJURY and damage has been caused by fires involving deep fat fryers. The fire hazards of cooking with oil, especially with deep fat fryers, has been known about for many years. As a result of these experiences a number of safety measures are being recommended. Fire Tests have shown that most of the normal measures imposed to deal with these fires have been ineffectual. With high-pressure water mist systems a solution has been found that is safe, clean and effective in dealing with fires within kitchen areas.

Today, deep fat fryers are found in most commercial kitchens, the risks to life and property as well as business interruption has never been of greater importance. Fires involving fryers start for various reasons, but the types of systems being installed at the request of local authorities or insurers still lead to damages to the equipment and business they are supposed to protect. At last with the development and research carried out with high-pressure water mist systems, there is a true alternative.

WHY DO FIRES OCCUR?

In a lot of incidents the fryer equipment is to blame as the built in safety measures may have failed i.e. Oil temperature thermostats etc. If this device fails, then the oil will continue to be heated until its auto ignition temperature is reached.

Another cause of fire happens when solid cooking fat is put into a fryer that is already at its optimum cooking temperature. The oil that has already melted soon reaches its auto ignition temperature and a fire occurs, the remaining oil eventually adding to the intensity of the fire.

Additionally, oil that is repeatedly used becomes ‘dirty’ and the amount of free fatty acids (FFA’s) increases. These lower the oil’s flash point and auto ignition temperature decreases. An indication that the oil is reaching its critical temperature is the density of the ‘blue’ smoke.

RECOMMENDED SAFETY MEASURES AND THEIR EFFECTS

For some time now, it has been common advise by the fire authorities to place a fire extinguishing blanket next

Pic courtesy of Fogtec

to the deep fat fryer. In the event of an emergency the blanket could be placed over the fire and the cooking equipment, this will cut off the supply of oxygen to the fire and the fire will be extinguished. This action, although effective, places the person using the blanket at considerable risk. Unless the person using the blanket is well trained and ideally wearing protective clothing, the risks can be very high.

Another common method of fire protection within the kitchen environment are portable fire extinguishers. For this application normally portable fire extinguishers with Carbon dioxide (CO_2) or Class – B – Powder (according to EN 3) have been used. Tests and experience have shown that these also provide a great deal of risk to the untrained user. With a CO_2 extinguisher the extinguishing effect could be only temporary due to re-ignition of the oil as the oil is still at high temperature. Additionally the flair up from re-ignition could endanger personnel in the vicinity. With portable powder extinguishers the results are almost identical, in addition the powder if directed directly at the oil surface, could cause major disruption of the oil surface resulting in additional complications of burning oil being spread in the risk area.

To conclude, it is clear that the most effective and safest type of protection for fryers would be a fixed automatic system. This not only is the most effective way forward but also removes the reliance on untrained staff.

When selecting the best type of fixed system for the risk there are many things to consider. Some types of fixed system contaminate the kitchen and the equipment when discharged, others provide a safety risk to personnel in the vicinity. There are associated costs that vary depending upon the type of fixed system and the extinguishing medium employed. Ease of installation is another factor that needs to be considered. High-pressure water mist systems fulfil all the requirements.

STANDARDS FOR EXTINGUISHING SYSTEMS FOR DEEP FAT FRYERS – NEEDS OF THE SYSTEMS

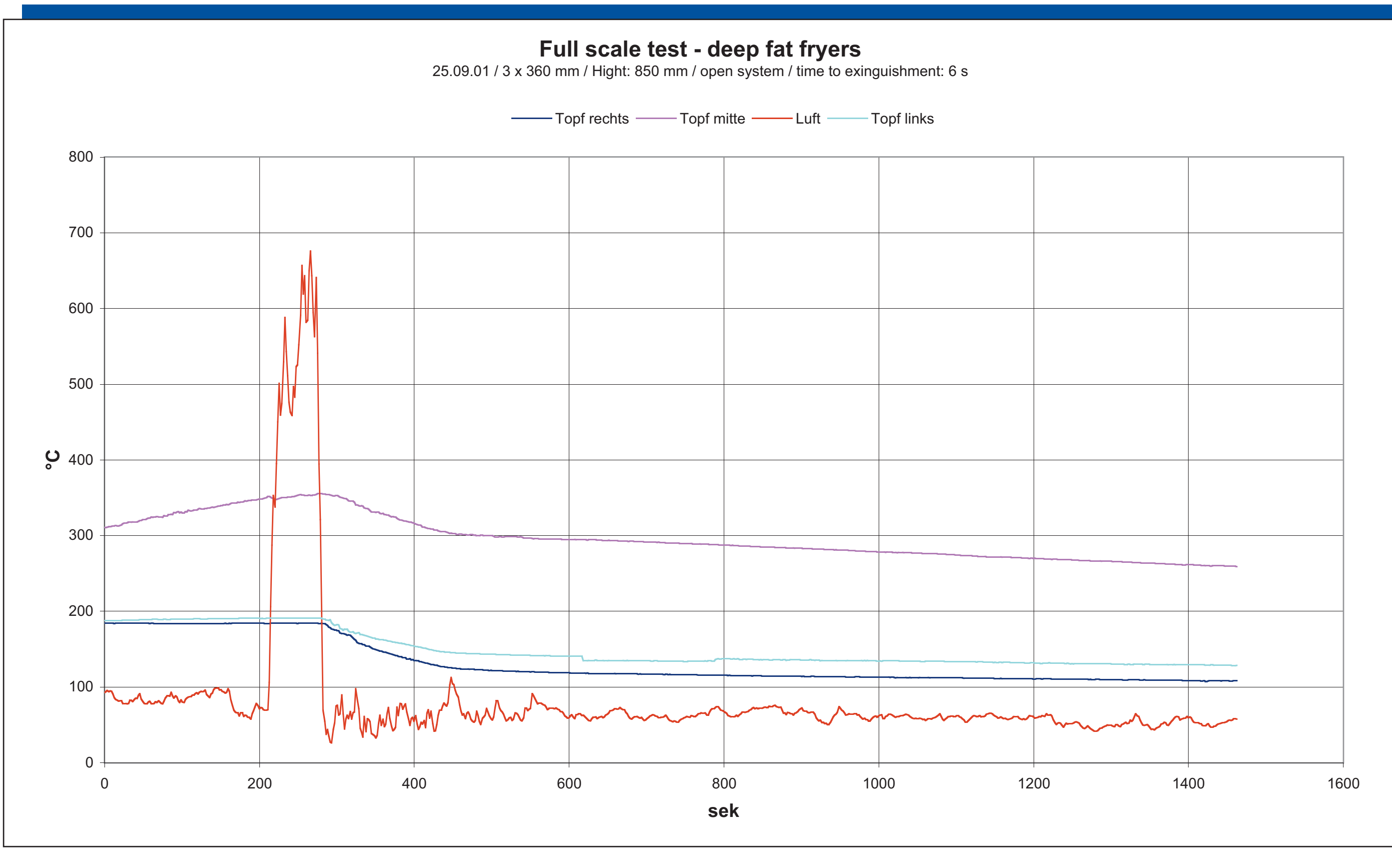
There exists several standards classifying the characteristics for an extinguishing system for deep fat fryers. Although there are differences between the different standards, from IMO or ISO for example, the expectations of the systems are clear. The fire extinguishing system must extinguish the fire completely. There must be no re-ignition within 20 minutes, it is essential therefore that the fire not only be 'snuffed' out quickly but cooling takes place to prevent re-ignition by lowering the temperature to below its flash point. The auto-ignition temperature and flash point may vary between oil type and manufacturer but typically this would be 360°C and 220°C respectively. Another requirement is that the oil remains inside the fryer when the system is discharged. Up to now, the common types of fixed systems have proven to have disadvantaged and some even to be dangerous. The German Work Safety Agency (BGN) showed this during research. Without doubt the most effective way to extinguish fires in deep fat fryers is with a high-pressure water mist system.

WATER MIST TECHNOLOGY FOR PROTECTION OF DEEP FAT FRYERS

The cooling effect of water is unquestionable, but in the past, due to the technology of the time, it was almost impossible, even dangerous, to attempt to extinguish burning liquids with water. The density of the water droplets resulted in the water sinking into the oil, converting to steam with explosive force resulting in an eruption of burning oil and oil vapour.

Although high-pressure water mist systems use the same fire-fighting medium, the droplets are very fine. Because of the small size (below 100 μm) they are also extremely light weight and do not penetrate the oil surface. As the droplet approaches the surface of the oil it absorbs the heat from the fire and immediately converts to steam. This conversion results in a localized inerting effect at the surface of the oil. After the fire has been extinguished the cooling process continues as the droplets absorb the energy from the hot oil and surrounding metal. The conversion rate of the water droplet to steam is instantaneous so the extinguishing time is also very fast. The high-pressure nitrogen that is stored in its own cylinder achieves the momentum required to push the fine droplets into the fire.

An added bonus of the water mist system is the ability to limit the amount of radiated heat that escapes from the fire zone.



DESIGN OF A HIGH-PRESSURE WATER MIST SYSTEM FOR DEEP FAT FRYERS

A cost effective water mist system uses separate water and nitrogen cylinders. Because of their small size these can be positioned in an area next to or adjacent the fryers. To guarantee that the system will work effectively and quickly, it is recommended that the system is activated automatically. This method removes the need for human intervention.

The system described would have nozzles strategically positioned over the fryer and within the fume extract ducting. The selection of the type of nozzle has to be done carefully, to maximize the effects and response time. It has been proven in full scale testing that the type of nozzle used could depend upon oil type, equipment being protected, surface area, height etc. Hygiene is another consideration and the use of stainless steel nozzles if recommended. Measures should be taken to prevent oil residue and contamination from affecting the nozzles ability to operate. This can be achieved in different ways.

Pic courtesy of Fogtec

CONCLUSION

High-pressure water mist systems are the most effective way of protecting a kitchen frying area. However, it is important that knowledge and expertise are employed in the design of these systems. This will guarantee the effectiveness of the installed system. Additionally, maintenance is essential to maintain the systems integrity and the life of the system.

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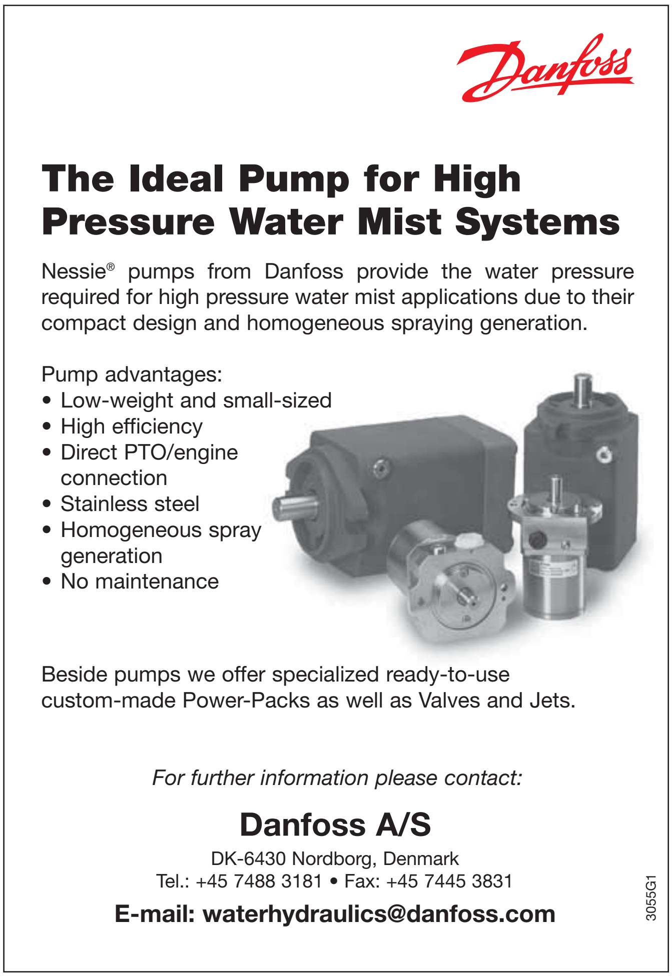

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Is Your Tunnel Protected Against Fire?

By Ian R. Holt
Regional Technical Manager,
Promat Internataional Asia Pacific

Aftermath of Fire in Mont Blanc tunnel, France

FIRES IN TUNNELS are a major hazard to human life and cause costly damage to the infrastructure. The limited escape facilities and the difficulties encountered by intervention forces in gaining access call for extensive safety arrangements, which must be complementary and mutually coordinated.

Tunnels and underground transport facilities are important means of communication, not only in terms of shorter journeys, but also increasingly out of consideration for the local population and the environment. Generally speaking, important underground transport links are expected to be available without any restrictions and to operate smoothly round the clock. Interruptions due to accidents, technical malfunctions or maintenance work quickly cause traffic jams and delays, and figure in transport policy statistics as economic losses.

Rising traffic densities and the growing demand for underground communication links result in a higher probability of accidents, injuries and damage. Added to this are other factors, which increase the potential hazards of traffic tunnels:

- The increasing length of modern tunnels
- The transport of hazardous materials
- Two-way traffic (with undivided carriageways)
- Higher fire loads due to growing traffic volumes and higher loading capacities
- Mechanical defects in motor vehicles

When considering a tunnel(s), it is usually in relation to road and rail infrastructure, however, use of the word tunnels can be slightly misleading, as the following apply equally to pedestrian walkways, underground rail stations, underground car parks etc, in fact, to any concrete structure.

It is usually assumed that because a structure is constructed using concrete, that it is inherently fire resistant, and therefore requires no additional fire protection measures to be taken. Unfortunately, experience over the years has shown that this is not necessarily the case and consideration must be given to the performance and behaviour of concrete structures under fire conditions. In addition, where tunnels and underground spaces are concerned, consideration must also be given to the provision of services protection, e.g. smoke extraction systems, protection to cables and wiring servicing emergency equipment etc.

There are three reasons for providing protection against fire within tunnels, firstly, there is the matter of life safety, this is not necessarily a function of structural performance under fire, although a collapsing structure would not enable people to exit a structure in safety, but more to do with the function of services such as emergency lighting, smoke extraction systems etc.

Secondly there is the performance of the structure itself, will it remain in-situ, will it collapse, possible causing collateral damage to other structures and injuries to people passing by etc.

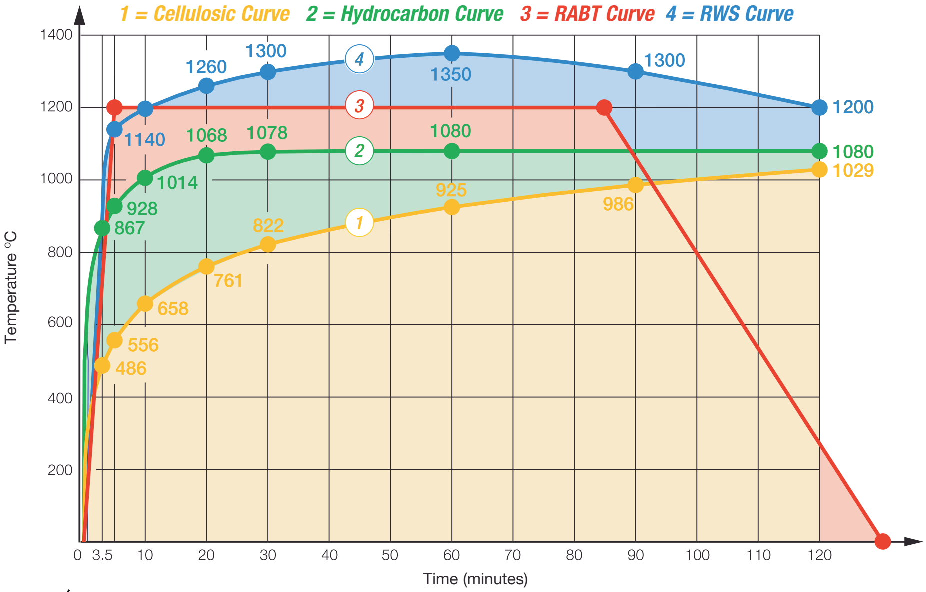
Thirdly, there is the economic damage caused as a result of the failure of a tunnel etc. This economic cost is not related solely to the repair or rebuilding of the structure; more usually it is the knock on impact of loss of business, traffic diversions etc which result in the largest costs. A prime example of this is the fire inside the Channel tunnel where the economic damage was estimated to be over twice the cost of the actual tunnel repairs, the direct repairs to the tunnel cost some €87 million, the additional costs in lost business, replacement of infrastructure, materials e.g. lorries, train carriages etc bring the economic loss alone to some €211 million. Using Mont Blanc tunnel as an example for a simple road tunnel, the differences are not so marked, with the cost of repair being estimated at some €189 million and the economic cost at some €203 million in addition. However, some two years after the fire occurred, Mont Blanc tunnel is still closed to commercial traffic, and the economic costs of diverting heavy goods vehicles continues to mount up.

Thus in terms of fire protection within tunnel and underground systems, the following items require consideration.

- Enhancing the fire resistance of the structure
- Air supply systems
- Smoke extract duct systems
- The provision of fire and smoke resistant safe havens in long tunnels
- Active and Passive detection systems
- Fire extinguishing systems

TYPES OF FIRE CURVES IN TUNNELS

In recent years, a great deal of research has taken place internationally to ascertain the types of fire, which could occur in tunnels and underground spaces. This research has taken place in both real, disused tunnels, and under laboratory conditions, as a consequence of the data obtained from these tests, a series of



Time/temperature curves

time/temperature curves for the various exposures have been developed as detailed below.

The RWS curve was developed based on the assumption that in a worst-case scenario, a fuel oil or petrol tanker fire with a fire load of 300MW lasting up to 120 minutes could occur.

The RWS curve was based on the results of testing carried out by TNO in the Netherlands in 1979. The difference between the RWS and the Hydrocarbon curve, bearing in mind that they are both using as the fire load similar materials, is that the latter is based on the temperatures that would be expected from a fire occurring within a relatively open space, where some dissipation of the heat would occur, whereas the RWS curve is based on the sort of temperature you would find when a fire occurs in an enclosed area, such as a tunnel, where there is little or no chance of heat dissipating into the surrounding atmosphere.

The RWS curve simulates the initial rapid growth of a fire using a petroleum tanker as the source, and the gradual drop in temperatures to be expected as the fuel load is burnt off.

The RABT curve was developed in Germany as a result of a series of test programmes such as the Eureka project. In the RABT curve, the temperature rise is very rapid up to 1200°C within 5 minutes, faster than the Hydrocarbon curve, which rises only to 1150°C after 60 minutes. The duration of the 1200°C exposure is shorter than other curves with the temperature drop off starting to occur at 60 minutes.

This test curve can be adapted to meet specific requirements, in testing to this exposure, the heat rise is very rapid, but is only held for a period of 30 minutes, similar to the sort of temperature rise you would expect from a simple truck fire, but with a cooling down period of 110 minutes. If required, for specific types of exposure, the heating period can be extended to 60 minutes or more, but the 110 minute cooling period would still be applied.

Over the past hundred years or so, as stated in the introduction, millions upon millions of people have come to regard concrete as a solid and dependable product, used in every conceivable type of structure; for buildings, bridges, tunnels and sometimes even ships.

Concrete has always been thought of as behaving well in a fire. Not just because it is non-combustible, but also because as part of a structure, concrete has better fire-resistant properties than, say, unprotected steel. Yet if we compare the loss of strength in concrete and steel as temperature rises we find that the two materials differ very little in this respect.

The fire resistance of a concrete structural member is derived from the following properties:

Low coefficient of thermal conductivity

This term refers to the fact that the heat generated by exposure to fire is less able to penetrate structural members.

High thermal capacity

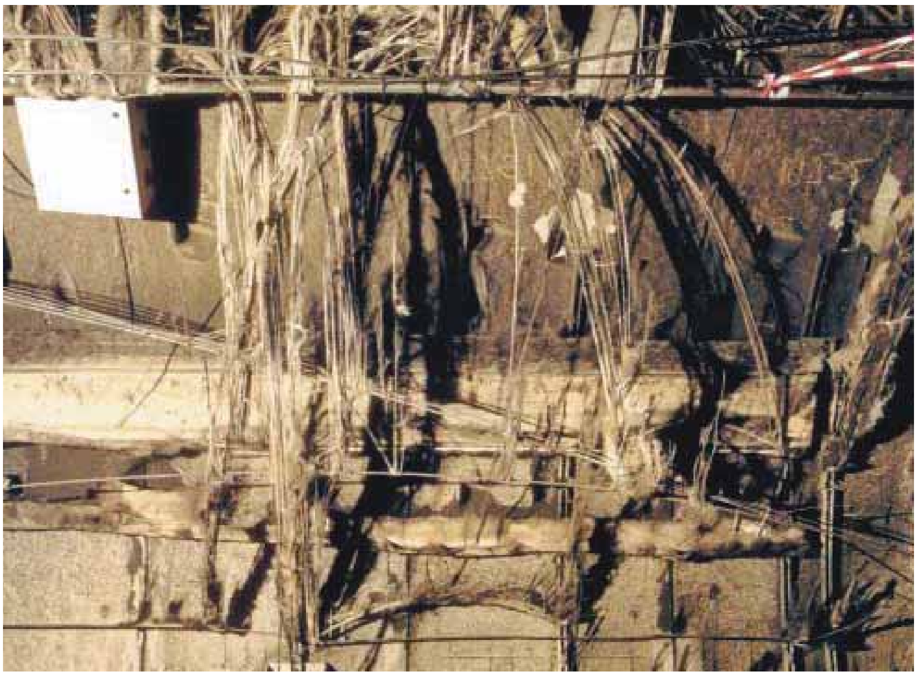
This means that the rise in temperature in the outermost surface layer of the concrete is far more rapid than in that within the depth of the concrete. As a result, the average rate of temperature rise in a concrete member is relatively low.

MASS

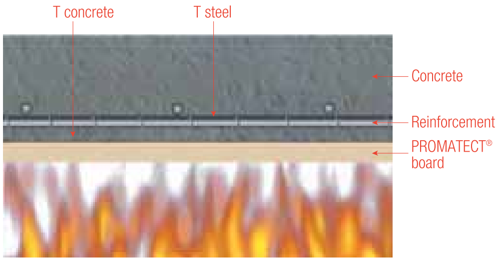
Because concrete has less inherent strength than steel, the cross sections of concrete structural members are always larger, given the same loadbearing capacity, than those of steel members. Only reinforced or pre-stressed concrete can absorb tensile stresses. However, the behaviour of the reinforcement is important not only in structural members subjected to bending and tension but also in reinforced concrete members subjected to compression.

In a fire, the rate of temperature rise to the critical temperature (approx. 500°C) in reinforcement subjected to tension is comparable to that in a steel girder, assuming that the steels are of approximately the same type and the maximum tension is of roughly the same order of magnitude. Experiments using standard fires (see figure on the following page) have shown that where reinforcement lacks the protection afforded by the concrete this critical temperature of approx. 500°C is reached within 10 minutes of exposure to the sort of temperatures that would be expected under fire conditions.

Given that a concrete member has inherently good fire resistance, the question naturally arises why, then, it is necessary in certain circumstances to protect it with fire-resistant cladding. Laboratory tests have shown that concrete structures subjected to compression generally fail when their compression strength is exceeded. In practice it will be rare for



Aftermath of Channel Tunnel Fire, England/France



Reinforcement temperatures

an entire structure to be subjected to compression, except perhaps where pre-stressed concrete has been used.

In the laboratory the concrete cross-section is heated by a standard fire. As a result of this the strength of the concrete falls until the critical temperature is reached. The critical temperature depends on the load. Netherlands standard NEN 6071 sets out, in 10.1.2.1, a simplified method of calculating this. There it is assumed that a cross-section is fully loadbearing at a temperature of 500°C or less. However, this 500°C is not the critical temperature: the hotter shell continues to bear some of the load while the core is not 100% loadbearing.

- Free & Chemically bound water combine to cause steam pressure build-up
- Expansion Ratio of water-to-steam = 1:1700
- Temperature in excess of 500°C
- Concrete Grade dependant
- Moisture content over 3% = spalling almost 100% within 30 minutes of exposure.

Note: On recent tests carried out on tunnels in Netherlands, the average moisture content of the concrete 10 years after construction was approximately 6–7%.

SPALLING

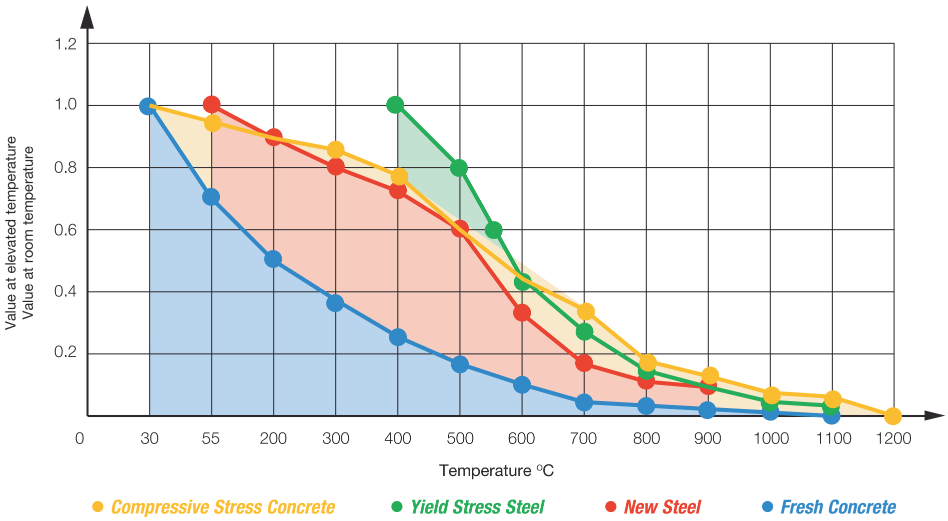
What is spalling? When mature dried concrete is exposed to extreme heat for long periods of time, the chemical bonds between the water molecules in the concrete break, destroying molecular bridges that bind together the various materials that make up concrete. As the water molecules are pulled out of the skeleton through dehydration, the concrete loses its cohesion and weakens, pushing pieces of the concrete off the tunnel walls in very thin layers resembling onion peel. This phenomenon, called spalling, can eventually work its way through the entire concrete ring lining a tunnel, layer by layer.

Research has shown that concrete structures can suffer surface spalling as a result of high compression stresses in the heated outermost layers and by the generation of water vapour at a high pressure behind those layers. The probability of spalling increases with compression stress and the moisture content of the concrete. With a moisture content of over 3% of the mass, the probability of spalling is virtually 100%. It is precisely in columns and pre-stressed beams that compression stresses are high.

Rapid rates of heating, large compressive stresses or high moisture contents (over 5% by volume or 2% to 3% by mass of dense concrete) can lead to spalling of concrete cover at elevated temperatures, particularly for thicknesses exceeding 40 mm to 50 mm. This moisture is not only physically present, but also chemically bound within the concrete.

The latest investigations into the fire performance of concrete show that even the addition of polypropylene fibres into the concrete mix, will not suffice to reduce this water vapour pressure, and thus has little effect on reducing the incidence of spalling.

Such spalling may impair performance by exposing the reinforcement or tendons to the fire or by reducing the cross-sectional area of concrete. Concretes made from limestone aggregates are less susceptible to spalling than concretes made from aggregates containing a higher proportion of silica, e.g. flint, quartzites and granites. Concrete made from manufactured lightweight aggregates suffer a lesser degree of spalling. The use of high strength concrete has been introduced as it can reduce the necessary thickness required to obtain a certain structural performance, however, high strength concrete is particularly prone to severe spalling when exposed to fire, as such, because the depth of the



Influence of temperature on concrete

concrete has been reduced already, the effects of spalling are even more severe than normal.

In addition to surface spalling, the in depth research that has taken place, both after real fires, and when tests have been carried out in disused tunnels (e.g. the Eureka project) show that deep cracks will appear in the concrete after the substrate has cooled down.

When spalling occurs which can also be dangerous for the immediate environment due to the explosive nature of the spalling on some types of concrete the reinforcement is exposed. In a normal fire ordinary reinforced concrete is unlikely to fail completely but repair costs can be considerable. Where prestressed concrete has been used the detrimental effect of spalling is greater and more dangerous.

Based on the requirements for exposure to an RWS type fire:

- Temperature on the concrete interface should not exceed 380°C (for bored tunnels this limit is 200–250°C)
- Temperature on the reinforcement should not exceed 250°C with a minimum of 25mm concrete cover

Note: For exposure to RABT, the reinforcement temperature should not exceed 300°C.

There is a high risk of failure due to the temperature of the steel in the concrete in columns with a high reinforcement level under high loads. For this reason, the (non-normative) tables give a critical steel temperature of 500°C for ordinary concrete, steel and 400°C for tension steel. In the Netherlands, Rijkswaterstaat lays down for tunnels a maximum permissible concrete surface temperature of 380°C. This maximum was set not because of any perception that concrete fails at that temperature, but because it is assumed that in practice this is a temperature at which there is only a very small probability of damage to concrete. This requirement also implies that the temperature of the underlying reinforcement remains low, so that its strength is unimpaired. In Switzerland the maximum is set even lower: there the surface of the concrete in tunnels must not exceed 250°C.

Kidde Products

Kidde Fire Protection

One of the most catastrophic events that can befall tunnel operators, is fire. Several high profile cases; Eurotunnel, Mont Blanc, Gotthard, Tauern and the events at Kings Cross in 1987, have demonstrated that the consequences of tunnel fires are more than just the threat to life. Costly repairs, disruption to service, loss of income and loss of users' confidence, are also extremely damaging.

New Approach Needed

Road tunnels present one of the most challenging scenarios for fire protection because of:

- Products of combustion from vehicle exhausts
- Harsh ambient conditions (dust, soot, moisture, corrosive gases, extreme temperatures)
- High velocity ventilation
- Fast moving vehicles containing flammable liquids
- Goods vehicles carrying flammable products classed as non-hazardous
- Unlimited public access
- Limited evacuation routes

Fires are caused primarily by accidents and by mechanical failures. Monitoring traffic flow for stationary vehicles is often the earliest indication of a problem. Fires may be reported quickly by witnesses, but the information can often be unclear. With tunnels many kilometres long, precise information about the exact location of a fire is essential if emergency services are to be deployed effectively.

Point-type fire detectors are unsuitable for tunnel protection due to black airborne particles from exhausts as well as temperature and humidity fluctuations. Beam smoke detectors are unsuitable due to high levels of dust and fumes, plus the high levels of movement and obstructions.

Against this background, Kidde Products can provide a number of systems which are suitable for tunnel protection.

Alarmline Linear Heat Detection

Alarmline is a heat sensitive cable, which reacts to an increase in temperature to provide an alarm. Robust reliable and maintenance-free, its mechanical and electrical properties render it immune to interference from dust, dirt, moisture, carbon monoxide, electromagnetic interference and washdowns. Alarmline's main benefits are its ability to be placed close to the protected risk and to monitor long lengths of cable on a single zone.

Kidde products offers two types of Alarmline: Digital and Analogue.

Alarmline Digital cable will short – circuit at a specific temperature. The cable, which is available in various temperature range settings, can connect directly to a zone of a conventional fire alarm panel, making it an extremely cost effective solution for tunnels. Alarmline Analogue cable can be programmed via its associated control unit to provide an alarm at a specified temperature range.

Both types of Alarmline can provide an indication of the fire's location. When interfaced to a dedicated control unit, digital LHD cable can provide indication of the fire location to within 1% of the total cable length. Both digital and analogue cable can be connected to an analogue addressable fire alarm panel via interface modules; this enables zonal output control for smoke extraction & ventilation, fire suppression and annunciation devices.

Other applications for Alarmline include conveyors, cable trays, fuel distribution terminals, mines, offshore platforms, tank farms and refrigerated storage.

High Sensitivity Smoke Detection (HSSD)

For tunnel fires, rapid detection is vital. High Sensitivity Smoke Detectors (HSSD™) such as Kidde's Hart XL, detect smoke during the very early stages of a fire. This allows fire suppression measures to be deployed whilst a fire is still in its early stages, which could make a big difference to the outcome of the incident.

An HSSD system comprises a central detection unit fitted with an aspirator that draws air through a pipe network installed at the tunnel ceiling. Sample holes are installed along the pipework and air is drawn into the detector for analysis. Unlike some other HSSD devices, Hart XL uses laser-based particle counting and software algorithms to determine smoke concentration and to discriminate between dust and smoke particles. No filters are required.

Recent tests using HSSD in road tunnels have shown that background smoke levels, even in peak traffic, rarely exceed 0.2% obscuration per metre, well within the programmable sensitivity range of Hart XL. Alarm levels can be set above the ambient background smoke level, eliminating unwanted alarms. Four independent alarm levels allow forewarning of any subtle change in ambient smoke levels, such as from an incipient fire in a moving vehicle.

Because Hart XL does not use filters, maintenance costs are minimised to cleaning the pipework with compressed air and performing a few simple checks on the detection unit.

Sump protection

Kidde Products also provides a solution to the hazards posed by tunnel sumps, which are used for collecting any spillages from traffic in a tunnel. The Ginge Kerr inert gas foam system protects the sump area from becoming explosive or hazardous in the event of flammable liquid or chemical spills.

When discharged into the sump, inert gas or nitrogen bearing foam displaces flammable or toxic gases and greatly reduces evaporation of any remaining fluids. Eleven systems have been installed over recent years including the Oresund Link between Denmark and Sweden, Mersey Kingsway and Medway tunnels. Another system is to be installed in the new Dublin Port tunnel.

The most practical and cost-effective solution to tunnel fire protection will incorporate many different elements linked through an analogue addressable control panel interfaced to the tunnel management system. Whatever technology is used, it is essential that it is suitable for the application in terms of effectiveness, speed of detection, maintainability and system integration.

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AirSense Technology Limited has been awarded the prestigious Underwriters Laboratories (UL) Listing on two aspirating smoke detection systems, the market leading Stratos-HSSD-2 and Stratos-MICRA 25.

AirSense achieved the UL Listing by testing their products at FRS, the fire division of BRE, with help and support from the Security and Signalling Conformity Assessment Services at UL. FRS is the only organisation outside of North America that offers testing services in support of UL Listing of fire detection and fire alarm systems.

Peter Fox, Managing Director at AirSense said, 'Being the first UK manufacturer of aspirating fire detection products to gain UL Listing outside of the USA is an incredible achievement for us. It gives us a major competitive edge over our competitors and marks a major milestone for all parties involved.'

For more information please contact:
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FIRE ALARM TEST EQUIPMENT

HSI Fire & Safety Group, a new division of **Home Safeguard Industries**, is the world's leading manufacturer of fire alarm test and maintenance equipment. It's new line of **VersaTools™** includes the **VersaTools™** aerosol dispenser for functional testing of smoke and CO detectors *and* the **VersaPole™** telescoping fiberglass test pole with 20′ extendable reach. Optional 4′ extensions are available. **HSI Fire & Safety Group** has also recently expanded its original **Smoke Detector Tester™** aerosol offering with its new 4.87 oz size. Both aerosols are UL listed, alarm manufacturer approved and meet NFPA 72 and international fire code test requirements. Put **VersaTools™** to the test today! Visit us @ www.detectortestequipment.com

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LPG LAUNCHES NEW AUTOMATIC PRESSURE RELIEF DAMPERS

LPG, the Spanish manufacturer of fixed fire suppression systems is expanding it's range of products with the developing of automatic pressure relief dampers.

The discharge of a fixed extinguisher system that uses pressurised gas as the extinguishing agent creates on discharge a considerable increase in the volume of gas in the area being protected, thus causing an increase in pressure in the room. This effect may cause structural damage to the area being protected, which makes it evident that there is a need to limit this increase in pressure through the installation of pressure relief dampers.

LPG pressure relief dampers do not require any type of signal or external components in order to work. When a discharge takes place, the increase in pressure within the room causes the dampers to open, thus easing the overpressure. When the pressure decreases, the grilles in the damper close, making the room airtight.

Main features:

- Design according to UNE, ISO, NFPA, CEA and BRITISH STANDARD regulations.
- Temperature resistance up to 1000 ºC for 2 hours.
- Adjustable to walls of different thickness.
- Simplicity of the system.
- Automatic action device.
- Good level of air tightness.
- Aesthetic appearance.

Benefits:

- Easy to install.
- Low inspection and maintenance costs.

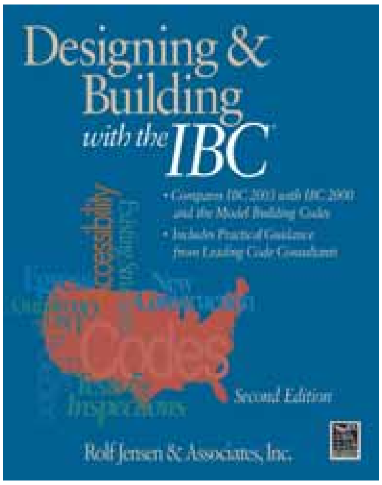
The pressure relief area has to be calculated to avoid structural damage in the enclosure but without under any circumstances compromising the capacity for maintaining the concentration of the extinguishing agent for a period of time sufficient for putting out the fire.

For more information please contact:
LPG Técnicas en Extinción de Incendios, S.A.
Tel: +34 93 480 2925
E-mail: marketing@lpg.es

LPG PRODUCT PROFILE CORRECTION

In the August issue of *IFP* on page 27, we reported that "LPG systems and components for HFC-125/NAF S 125 are certified by the LPCB". What we should have reported is "LPG system components for HFC-125/NAF S 125 are certified by the LPCB" We apologise for this error.

ROLF JENSEN & ASSOCIATES RELEASES CODE COMPARISION BOOK *DESIGNING & BUILDING WITH THE IBC*



CHICAGO, IL – **Rolf Jensen & Associates, Inc.** (RJA), a global leader in fire protection and building code consulting, announces the release of *Designing & Building with the IBC, Second Edition.*

Introduced at the 2003 ICC Codes Forum in Nashville, Tennessee in September, *Designing & Building with the IBC* is an essential reference on the latest building codes that allows architects, engineers, building officials, and contractors to easily compare the new International Building Code® (IBC) 2003 to the three model building codes and the 2000 edition of the IBC.

"Foreseeing the challenges the design community would face as jurisdictions adopted the IBC, RJA developed the first edition of *Designing & Building with the IBC* as a resource to aid the practitioner in transitioning to the latest revised edition," states Martin

Reiss, President and CEO of The RJA Group. He adds, "ICC partnering with RJA further established this guidebook as an invaluable reference tool for both the design community and the building official."

RJA teamed with the International Code Council to update the second edition allowing design and building professionals to transition smoothly to the 2003 edition of the IBC. *Designing & Building with the IBC* is designed for ease and use and includes a quick find index of the code references, a side-by-side comparison of the 2003 IBC to the three model building codes and 2000 IBC, expert code commentary from RJA and the ICC along with expand illustrations, a reference section and other useful information.

"*Designing & Building with the IBC* guides and assists code regulators, designers, and contractors familiar with the provisions of a model code in making the transition to the IBC. It is an indispensable reference tool for the code regulator, architect, engineer, and contractors," said James Lee Witt, CEO of the International Code Council.

To learn more about *Designing & Building with the IBC* visit RJA's website at www.rjagroup.com. To purchase the book, call 1-888-831-4RJA or order online.

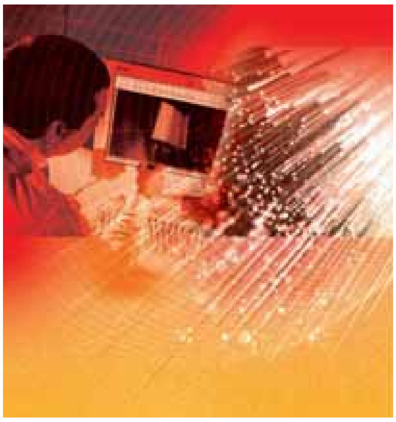
About Rolf Jensen & Associates, Inc.

Founded in 1969, Rolf Jensen & Associates, Inc. provides project solutions to life safety, building code, accessibility, and fire protection challenges. A subsidiary of The RJA Group, *fire protection and security consultants*, RJA is the worldwide leader in fire protection engineering consulting with offices across the country and strategic alliances around the world to deliver projects and meet client needs.

To learn more about The RJA Group, Inc. or any of the company's subsidiaries call the RJA MARKETING LINE 888-831-4RJA or visit their website www.rjagroup.com.

For more information please contact:
Contact: Patrick Johnson
+1312 831-8200

SENSA LAUNCHES LTS240



– up to four kilometers of Linear Heat Detection

A new addition to **Sensa**'s fiber optic range has been developed directly from the results of customer research. LTS240 produces temperature versus distance profiles for up to four kilometers of sensor cable.

Using a dual redundant configuration a sensor control unit monitors the fiber optic sensor from each end. This gives unrivalled accuracy and positional resolution with the added benefit of ensuring the security of the detection system, should a sensor become damaged.

Sensa's LTS240 meets all the requirements of projects needing cost-effective detecting systems over long distances and compliments Sensa's flagship LTS700 which monitors up to 8km.

For more information please contact:
Sensa
Tel : +44(0)23 8076 5500,
Web: www.sensa.org

TRIDONIC.ATCO TAKES CONTROL OF EMERGENCY LIGHTING

The new EM...SELFTEST module from **Tridonic.Atco** uses power control technology to provide enhanced control of emergency lighting and can be used with amalgam or non-amalgam compact and linear fluorescent lamps from 4W to 80W and nickel cadmium or nickel metal hydride batteries. It also incorporates self-commissioning and self-testing features for continuous monitoring, weekly function tests and annual duration testing.

EM...SELFTEST has a low profile, making it suitable for use with compact T5 luminaires and uses 5 pole technology to ensure total isolation and compatibility between the ballast, inverter and supply system. A three level "intelligent" charging system is used to provide pre-conditioning, fast charge mode and maintenance mode for trickle charging of the batteries. On switching from normal to emergency operation, the lamp is started using cathode heating and controlled start technology.

Once started the module operates the lamp at twice the normal emergency power level for 55 seconds, ensuring that the lamp is correctly heated to ensure maximum lumen output during the normal emergency duration. This feature ensures a longer lamp life and is critical for T5 lamps. It also provides a higher lumen output during the most critical switch over phase ensuring greater visibility of potential dangers.

After the 55-second boost phase, lamp power is reduced to the normal emergency level to give the declared Ballast Lumen Factor over the required duration. The use of power control technology allows optimisation of lumen output for each lamp on a given module and battery pack.

In self-test mode, the module uses a simple and easy to understand combination of red and green LEDs. Green indicates the emergency luminaire is functioning correctly, flashing red indicates battery failure and continuous red indicates lamp failure.

Three phases of testing are available – continuous monitoring, weekly function testing and annual duration testing. During mains charging mode, the controller monitors both the charge condition and static battery status.

Each week at a predetermined time the EM...SELFTEST unit initiates a 30 second test to establish the functionality of the unit, battery and lamp. Each unit is pre-programmed to test on a different day to ensure minimum risk from all units testing at once. The test times can be set in each individual luminaire or across all luminaires on a particular sub circuit. Under normal conditions the unit will delay the test until the normal lighting supply has been switched off for longer than two minutes – minimising the risk of the test being carried out while the occupier is present. In the event that the supply is permanently connected or the lights are left on permanently the unit will "force" a function test after a further 24 hours.

The annual duration test would also normally occur at the same time as a weekly function test but to ensure this does not happen at a time of maximum risk or disruption, the unit incorporates an adaptive mode. This works by monitoring the normal lighting switched supply to the luminaire to establish a pattern of room occupancy.

The auto test standard pr IEC 62034 stipulates that a commissioning test must be conducted after installation. The EM...SELFTEST has a built in feature that monitors the installation phase looking for a period of continuous permanent supply connection of greater than 5 consecutive days. Once this period has been detected, the EM...SELFTEST will commence its commissioning and timing programme.

For more information please contact:
Tridonic.Atco
Tel :+44(0)1256 374300

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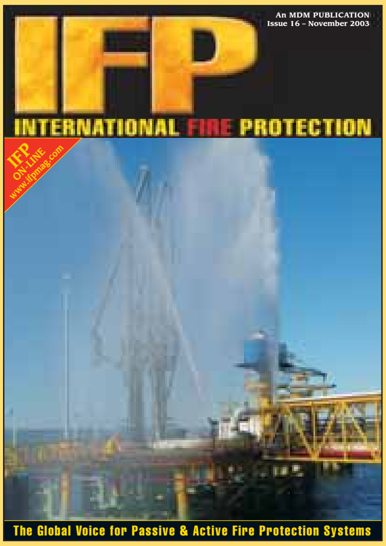

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(a small number of exceptions are listed in Annex VII in the regulations).

Now is the time to decide which system you are going to install and when you are going to install it.

Why Now?

- Allow enough time for a thorough evaluation
- Take control and make the conversion on your time line, not someone else's
- Eliminate the last minute rush when demand for technical resources will be overloaded and conversion costs at a premium

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- Fastest fire suppression system on the market
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